# EPSON

## User's Manual

AP-80 Printer

## FCC COMPLIANCE STATEMENT
## FOR AMERICAN USERS

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J or part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

— Reorient the receiving antenna

— Relocate the computer into a different outlet so that the computer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

"How to Identify and Resolve Radio-TV Interference Problems."

This booklet is available from the U.S. Government Printing Office, Washington, DC 20402. Stock No. 004-000-00345-4.

### WARNING

The connection of a non-shielded printer interface cable to this printer will invalidate the FCC Certification of this device and may cause interference levels which exceed the limits established by the FCC for this equipment.

Apple and Applesoft are trademarks of Apple Computer, Inc.
Macintosh is a trademark of Macintosh Laboratory, Inc.

# CONTENTS

# MAIN FEATURES

The AP-80 matrix printer provides the following features:

1. Paper-out detection, automatic paper loading, left and right margin settings (via switches or commands), and automatic paper ejection.

2. Buzzer function

3. A variety of character fonts are possible including Near Letter Quality (N.L.Q.), Proportional, and Graphic printing.

4. Form feed function, provided by a switch or command.

5. Self Test printing

6. Automatic printing

7. Double-Width Character mode

8. Bold Character mode

9. Italic Cursive Character mode

10. Superscript/Subscript Character mode

11. Download function

12. Internal RAM error detection

13. Hexadecimal dump list function

14. 2K bytes communication buffer

# _SPECIFICATIONS

## 1. SPECIFICATIONS

- Dimensions      W390 × H119 × D266 mm
- Weight      Approximately 4.9 kg
- Temperature      5 ~ 35°C, during operation
- Humidity      20 ~ 80%, during operation (No condensation)
- Power Supply      USA model: 117 VAC ± 10%
  Europe model: 220–240 VAC ± 10%
- Power Consumption      30 watts (Self test printing)
  15 watts (Stand-by)

## 2. PRINTING SPECIFICATIONS

- Print Method      Impact Dot Matrix (Bi-directional Logic Seeking)
- Print Head      9 pins
- Character Category      ASCII 120 characters
  Download 175 characters maximum
- Graphic Printing      8 categories: 576, 640, 768, 856, 960, 1088, 1152, 1280 dot columns/line
- Print Mode      Standard:

  | | |
  |---|---|
  | Extended | 9 CPI |
  | Pica | 10 CPI |
  | Elite | 12 CPI |
  | Semicondensed | 13.4 CPI |
  | Condensed | 15 CPI |
  | Ultracondensed | 17 CPI |

  Near Leter Quality:

  | | |
  |---|---|
  | Extended | 9 CPI |
  | Pica | 10 CPI |
  | Elite | 12 CPI |

  8 categories of graphic printing

Mixing any of the above modes within a single line is possible.
In addition, this printer is capable of Bold, Double Width, Superscript/Subscript, Proportional, and Italic Character modes.

- Paper Feed Method      Friction method
  Tractor method
- Line Feed Pitch      Minimum of 1/144 inch
- Line Feed Speed      6.7 lines/second (6 lines/inch)
  10 lines/second (9 lines/inch)
  (during continuous linefeed)

- Printing Forms        Paper width             4 inches – 10 inches

  Paper thickness       15 lbs. to 20 lbs. in U.S.A.

  $(52 \text{ g/m}^2 - 76 \text{ g/m}^2)$

  0.07 mm – 0.1 mm

- Multiple Copies      Original plus 2, non-carbon, $40 \text{ g/m}^2$

  Total thickness of less than 0.2 mm

- Ribbon               Cassette style, single color (Black)

# ▁SWITCHES AND LAMPS ▁▁▁▁▁▁▁▁▁▁▁▁▁▁

```
┌─────────────────────┐
│  ▯    POWER         │
│                     │
│  ▯    PAPER OUT     │
│                     │
│  ▯  ┌─────────────┐ │
│     │ ON-LINE     │ │
│     │ MARGIN MODE │ │
│     └─────────────┘ │
│     ┌─────────────┐ │
│  ▯  │ NLQ         │ │
│     │ MARGIN SET  │ │
│     └─────────────┘ │
│     ┌─────────────┐ │
│     │ FORM FEED   │ │
│     │ LEFT SET    │ │
│     └─────────────┘ │
│     ┌─────────────┐ │
│     │ LINE FEED   │ │
│     │ RIGHT SET   │ │
│     └─────────────┘ │
└─────────────────────┘
```
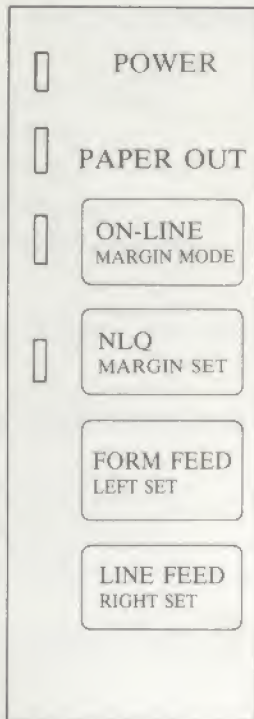
**A. POWER switch**
This switch turns the printer ON and OFF.

**B. ON-LINE switch**
This toggle switch puts the printer into the ON-LINE state. In the ON-LINE state, the printer is capable of receiving and printing data. In the OFF-LINE state, a BUSY signal is output. The head moves to the home position when the printer goes from the OFF-LINE state to the ON-LINE state. When the printer goes from the ON-LINE state to the OFF-LINE state, data in the line buffer are printed.

**C. NLQ switch (Near Letter Quality)**
(Valid only while in the OFF-LINE state)
This toggle switch selects the Near Letter Quality or Standard mode.
If the Near Letter Quality mode is selected, the lamp is on. If the Standard mode is selected, the lamp is off.

**D. LINE FEED switch**
(Valid only while in the OFF-LINE state)
Each time this switch is pressed, a 1/6-inch line feed is performed.

**E. FORM FEED switch**
(Valid only while in the OFF-LINE state)
Pressing this switch results in a form feed. The length of each page is determined by a DIP switch or command.

**F. POWER lamp (green)**
Remains on while the power is on.

**G. ON-LINE lamp (green)**
Is on while in the ON-LINE state (capable of receiving data). Is off while in the OFF-LINE state. If in the margin set mode, it flickers every 0.3 seconds.

**H. NLQ lamp (green)**

Is on while in the Near Letter Quality mode. Is off while in the Standard mode.

**I. PAPER OUT lamp (red)**

Is on if paper out is detected; the printer then enters the OFF-LINE state and outputs a BUSY signal, and the buzzer sounds for 1 second. If paper is inserted and the ON-LINE switch is pressed, this state is terminated. While in the error state, the lamp flickers.

# ▄PAPER LOADING▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄

## A. Cut Sheet Paper

Remove the tractor unit when using friction feed for the cut sheet paper.

1. Open the printer cover.
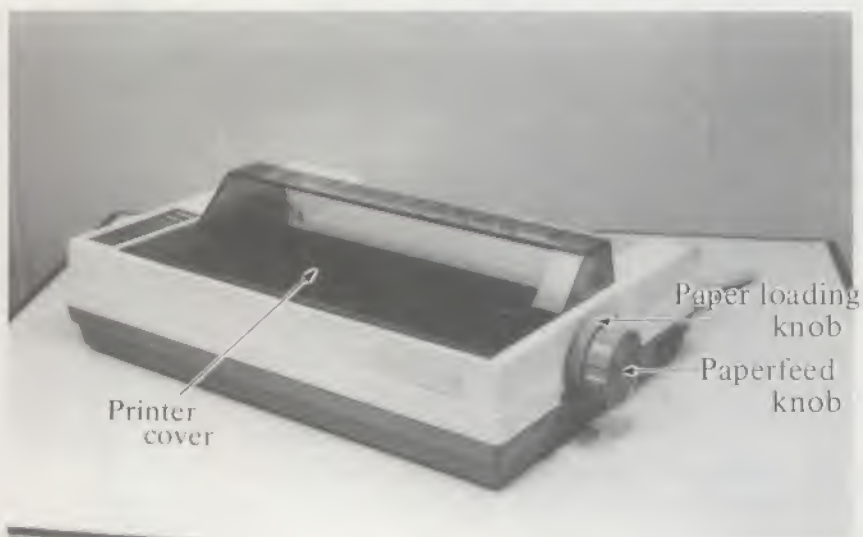


**Fig. 1**

2. Hold the paper rack upright and place it on the two supporters on both sides. Then insert the folding leg into the hole located on the top of the case.



**Fig. 2**

6
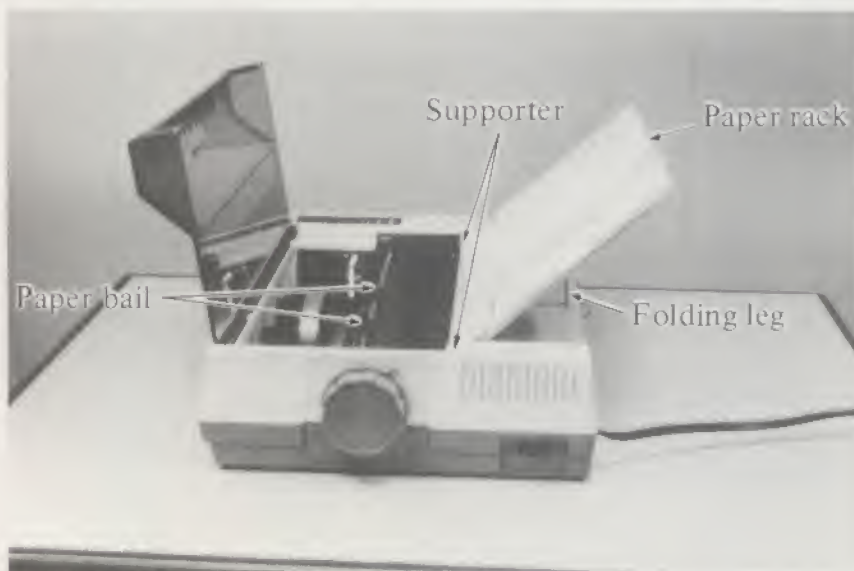
3. Slide the right paper guide to the extreme right.

4. Position the cut sheet paper at the extreme left of the paper rack, as shown below.
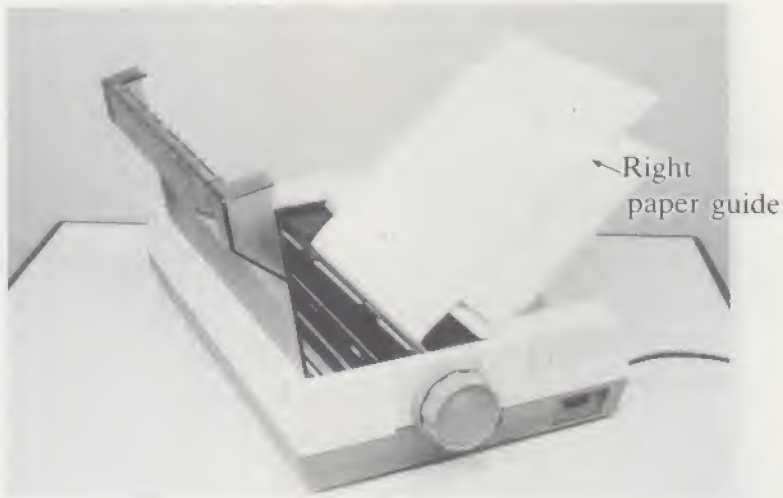


Right
paper guide

**Fig. 3**

5. Slide the right paper guide to the left to match the paper width.

6. Apply power to the printer.

7. The paper automatically advances to the TOF (top of form) position if the paper loading knob is turned counterclockwise.



**Fig. 4**

8. Turn the paper loading knob clockwise to set the paper bail.

9. Close the printer cover.

**NOTE 1:** To shift the loaded paper to the right or to the left, remove the paper using the paperfeed knob and repeat the process beginning with step 3.

**NOTE 2:** If a cut sheet is positioned at the leftmost side of the paper rack, printing starts at a position one inch away from the left edge of a form.
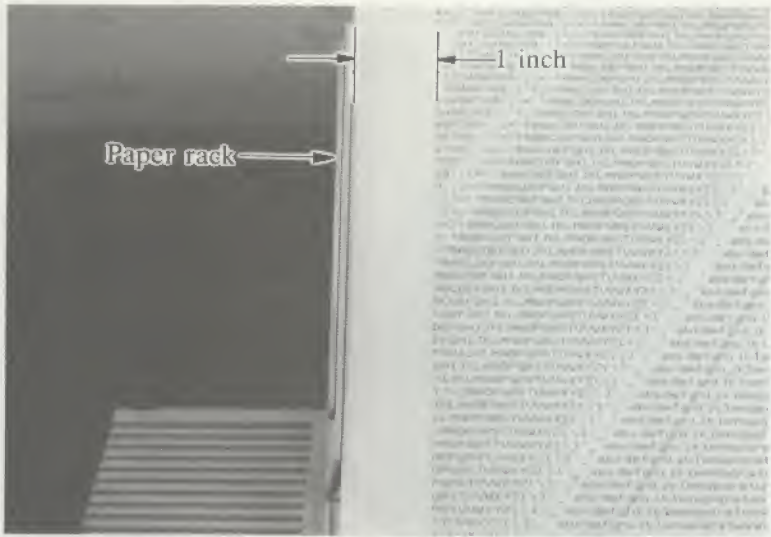


**Fig. 5**

**NOTE 3:** The position of the paper guide, which is installed at the leftmost end of the paper rack when shipped, can be adjusted by pulling it upwards and removing it from the paper rack. The user can then position is at any desired location.
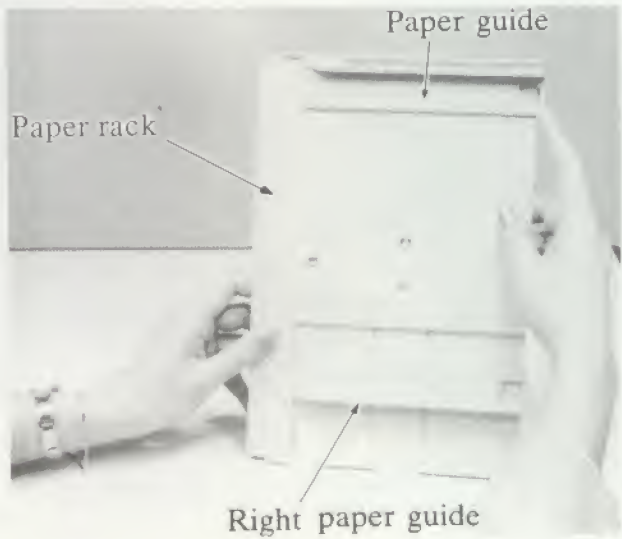


**Fig. 6**

**NOTE 4:** When using the paper loading knob to automatically set a form, the ribbon at the print head may be slightly raised. However, the user need not manually reset the ribbon because it automatically returns to its normal position before printing begins.

**NOTE 5:** Recommended roller position



(Correct)                              (Incorrect)
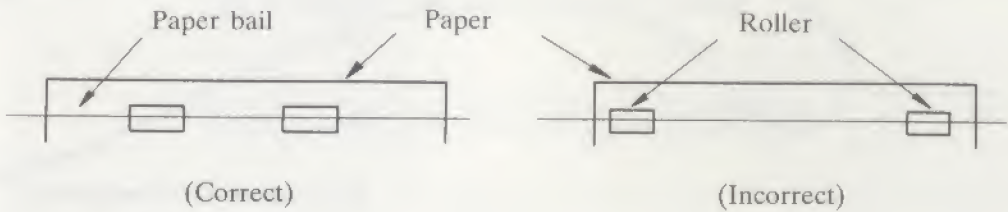
**Reference:** The paper-out detection switch is located at a position about six centimeters away from the left edge of the platen. The left edge of a cut sheet should cover the switch to avoid the paper-out condition.

## B. Continuous Forms

Tractor

Paper Rack

Print head

Paper

Platen
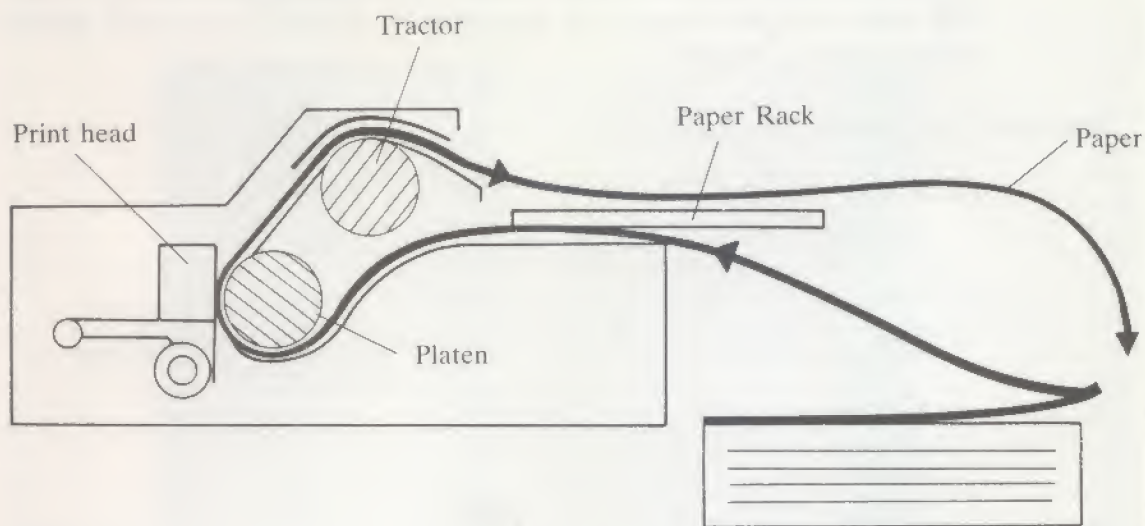
**Fig. 7** Paper feed path

1. Remove the paper rack and the printer cover.
   Make sure the power is turned OFF.

2. Turn the paper loading knob counterclockwise to move the paper bail toward the front.

3. Use the following method to install the tractor unit on the top of the platen:
   ① Insert the front hook of the tractor unit into the hole on both sides.
   ② Push down the rear of the tractor to fit the back hook securely.

Tractor Unit

①

Back Hook

②

Front-Hook
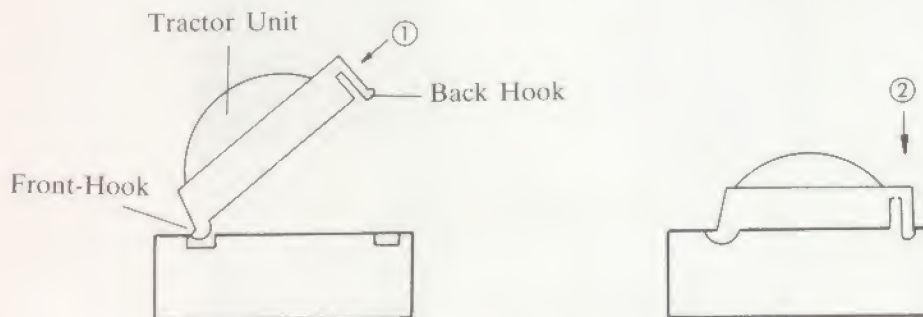
**Fig. 8**

4. Feed the paper into the printer from the back and then turn the paperfeed knob in a clockwise direction until the paper appears between the platen and the print head.

**Fig. 9**

5. Open the tractor covers on the left and right.

6. Adjust the tractors so that the distance between them matches the holes in the paper.

7. With the holes along both sides of the paper matched up with the paper feed pins on the left and right tractors, close the tractor covers.

8. Turn the paper loading knob clockwise to set the paper bail to the platen side.

**NOTE:** This is important because it releases the friction roller below the platen, allowing the paper to be advanced by the tractors only. Failing to release the friction roller may cause paper jamming.
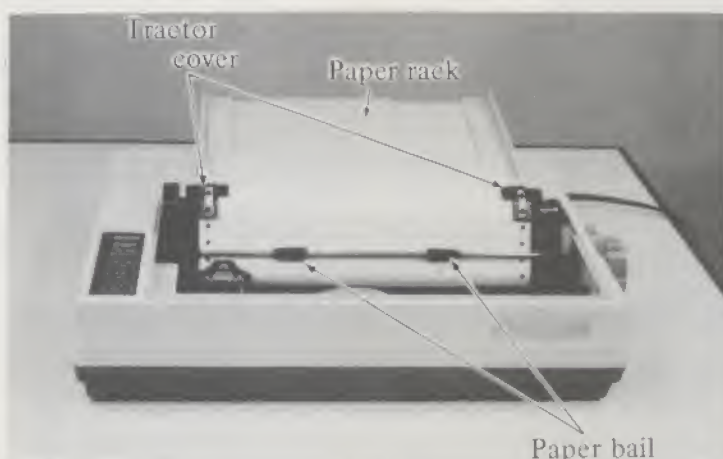


**Fig. 10**

9. Set the paper rack and the printer cover.

10. Turn the power switch ON.

11

## C. Top of Page Setting

**a. Cut Sheet**

    i) Paper out at power-on.

        If paper is input by the automatic paper loading function, printing is initiated 1 inch from the top.

        This 1-inch paper feed is stored in the printer's memory.

    ii) Paper already inserted at power-on.

        The position of the paper at the time of power-on will become the top of form. If cut sheets are to be used, make sure the print head is 1 inch from the top of the sheet.

**b. Continuous Form**

    i) Paper out at power-on.

        If paper is input by the automatic paper loading function, use the paperfeed knob to advance the paper so that the perforation is at the top of the print head. The power is then turned on once again to set the top of the page.

    ii) Paper already inserted at power-on.

        The position of the paper in front of the print head at the time of power-on becomes the top of form position.

    iii) To start printing at the perforation, use the paperfeed knob to adjust the paper so that the perforation is located directly above the print head. Then perform one of the following steps:

        1) Turn the power on once again.

        2) Perform an ⌷ESC⌷v⌷ command.

# RIBBON INSTALLATION/REMOVAL

### Installation

1. Turn the ribbon feed knob in the direction of the arrow to remove slack in the ribbon.



Ribbon feed knob    Ribbon

Arrow                Cassette
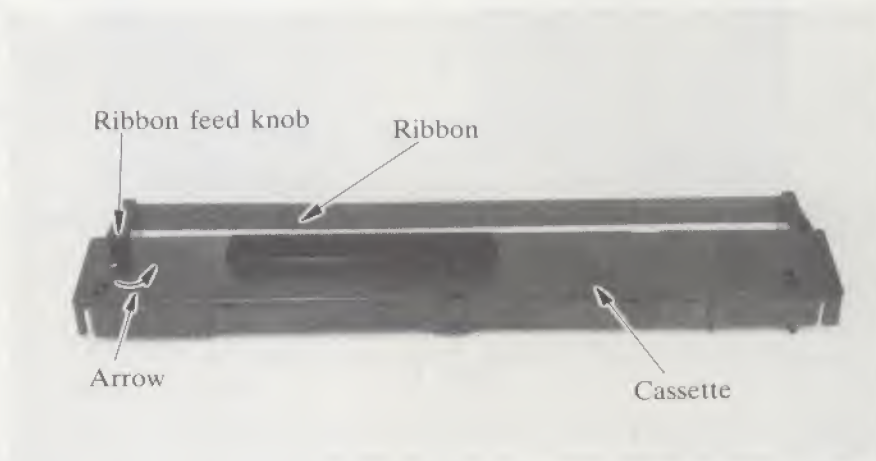
**Fig. 11**

2. Insert the ribbon between the ribbon mask and the print head, and position the cassette so that ribbon feed shaft is inserted into the hole under the ribbon feed knob.

**NOTE:** It is easier to insert the ribbon when the print head is at the home position (extreme left).



Ribbon mask

Ribbon feed shaft          Print head
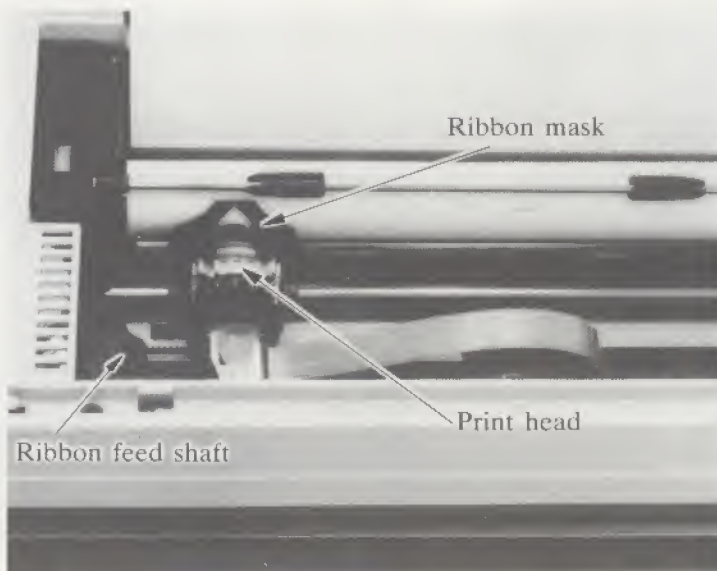
**Fig. 12**

3. Press on both sides of the cassette.



**Fig. 13**

4. Twist the ribbon feed knob of the cassette to tighten the ribbon. Make sure that the ribbon is properly positioned in front of the print head.

## Removal

Holding the fin of the cassette, pull up to remove it.



**Fig. 14**

# ▬HEAD POSITION ADJUSTMENT▬▬▬▬▬



The print head position can be adjusted using the head adjustment lever located inside of the printer on the right-hand side.
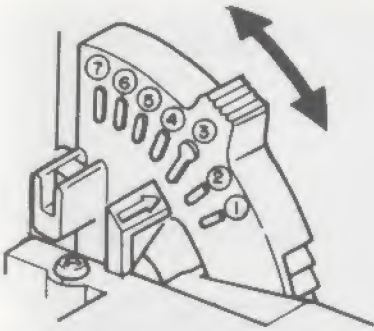
**Fig. 15** Internal right-hand side

Position ③ is suitable for one-part general paper. The printer is shipped with the lever set to position ③.
When using three-part paper, it is recommended that the lever be set to position ⑤ or ⑥.

# ─CONNECTING THE PRINTER TO MACINTOSH─
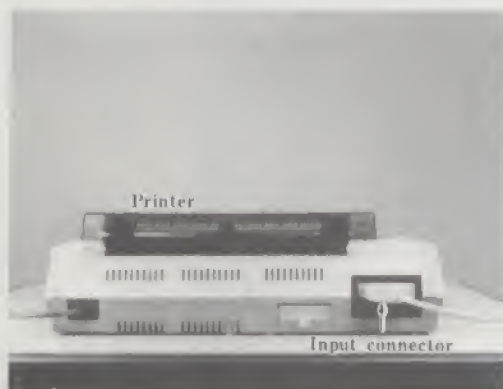


1. Purchase the cable used to connect the Apple Imagewriter to the Macintosh.

2. Connect the printer to the Macintosh, as shown above.

**Confirming the connection**

Make sure the DIP switches located at the back of the printer are set as shown below.

| DIP switch | 1–1 | 1–2 | 1–3 | 1–4 | 1–5 | 1–6 | 1–7 | 1–8 | 2–1 | 2–2 | 2–3 | 2–4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Setting as shipped | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | ON | OFF | OFF |

1. Apply power to the printer first and then to the Macintosh.
2. Install the ribbon cassette and load paper.
3. Insert the MACWRITE diskette and wait for the menu to appear.
4. Move the arrow to "MacWrite" on the screen and press the Mouse key twice.
5. Type "This is a nice printer."
6. Move the arrow to "File" on the screen. Press and hold down the Mouse key while moving it to "Print".

   This operation prints out:

   This is a nice printer.

   This printout shows that the connection is correct.

# ─CONNECTING THE PRINTER TO APPLE IIc─
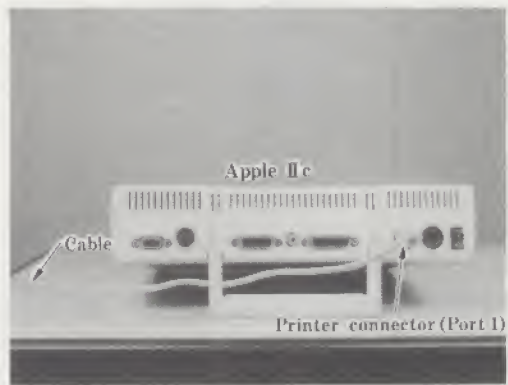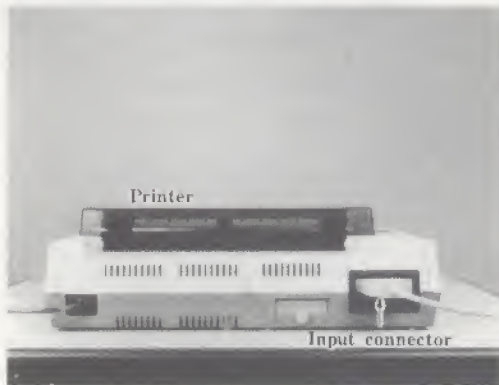


1. Purchase the cable used to connect the Apple Imagewriter to the Apple IIc.
2. Connect the printer to the Apple IIc, as shown above.

**Confirming the connection**

Make sure the DIP switches located at the back of the printer are set as shown below.

| DIP switch | 1–1 | 1–2 | 1–3 | 1–4 | 1–5 | 1–6 | 1–7 | 1–8 | 2–1 | 2–2 | 2–3 | 2–4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Setting as shipped | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | ON | OFF | OFF |

1. Apply power to the printer, the monitor, and the Apple IIc in this order.
2. Install the ribbon cassette and load paper.
3. Press the CONTROL and RESET keys simultaneously.
4. Type "HOME" and press the RETURN key.
5. Type "PR#1" and press the RETURN key.
6. Type 'PRINTING TEST" and press the RETURN key.

   This operation prints out:
   ] PRINTING TEST
   ? SYNTAX ERROR

   This printout shows that the connection is correct.
7. To return the keyboard output to the screen, type " PR #0 " and press the RETURN key.

## Printing from Applesoft BASIC

1. Insert the Applesoft BASIC diskette.
2. Press the ⌘ , CONTROL , and RESET keys simultaneoulsy, and then release the RESET key and the other two keys in this order.
3. Press the RETURN key to display the A/BASIC menu on the screen.
4. Press the 7 and RETURN keys to select the "Quit".
5. Press the RETURN key.
6. Type the following program.
7. Type "RUN" and press the RETURN key.

```
10   HOME :ESC$ = CHR$ (27)
20   PRINT "TEST TO SCREEN"
30   PRINT CHR$ (4); "PR#1": REM OUTPUT TO PRINTER
40   PRINT "PRINTING TEST"
50   PRINT CHR$ (14)
60   RPINT "DOUBLE WIDTH PRINTING"
70   PRINT CHR$ (15)
80   PRINT ESC$; "X"
90   PRINT "UNDERLINE"
100  RPINT ESC$; "Y"
110  PRINT CHR$ (4); "PR#0": REM OUTPUT TO SCREEN
120  END
```

**Note:** The PRINT command of Applesoft BASIC always outputs data with the 8th bit (MSB) being 1 to the printer.
The printer, however, functions correctly because it ignores the 8th bit.

As shipped from the factory, DIP switch 1-5 at the back of the printer is turned on to ignore the 8th bit of data. There are a few codes the PRINT command does not output to the printer.

Example: PRINT CHR$(4)

Refer to Applesoft BASIC manuals for further details.

# MARGIN SETTING BY SWITCHES

**(1) MARGIN MODE switch**

If this switch is pressed for more than 1 second in the ON-LINE state, the printer enters the right/left *margin set mode* (shown by the ON-LINE lamp going off and on every 0.3 seconds).

If pressed again, the printer returns to the ON-LINE state.

**(2) RIGHT SET switch**

(Valid only while in the margin set mode)

Pressing this switch moves the print head to the right of its present position. The margin position is located at the center of the print head.

**(3) LEFT SET switch**

(Valid only while in the margin set mode)

Pressing this switch moves the print head to the left of its present position. The margin position is located at the center of the print head.

**(4) MARGIN SET switch**

(Valid only while in the margin set mode)

Pressing this switch sets the margin positions.

The margins are set from left to right.

The printer returns to the ON-LINE state as soon as the right margin is set.

If only the left margin is to be set, set it and then press the MARGIN MODE switch.

If only the right margin is to be set, it must be set after the left margin.

The minimum margin setting possible is equivalent to the width of 4 extended characters.

After the margin is set, the buzzer sounds for approximately 0.1 second.

# ▃SELF TEST PRINTING FUNCTION▃▃▃▃▃▃▃▃▃

If the LINE FEED or NLQ switch is pressed during power-on, a pattern printed repeatedly. If the LINE FEED switch is pressed during power-on, the self test printing is performed alternately in Standard Character mode for five lines and NLQ mode for five lines in a continuous pattern. If the NLQ switch is pressed during power-on, the self test printing is performed in Near Letter Quality Character mode.

The printer is in the OFF-LINE state while performing the self test printing function. To stop the self test printing (and turn on the ON-LINE lamp), press the ON-LINE switch.

If a paper out is detected during the self test printing, the self test printing is terminated. The self test printing does not start in the paper-out state.

# ▃AUTOMATIC PRINTING FUNCTION▃▃▃▃▃▃▃▃

During the data input, if the amount of data exceeds 1 line, printing is automatically performed.

# ▃AUTOMATIC PAPER LOADING FUNCTION▃▃▃

At paper out, insert a form into the from entrance and turn the paper loading knob counterclockwise to automatically load the form into the printer.

The distance from the top of the form to the first line printed is 1 inch.

After loading, turn the paper loading knob clockwise.

# ⎯HEXADECIMAL DUMP LIST FUNCTION⎯⎯⎯⎯

The data that is input is printed as 2-digit hexadecimal numbers. This function can be set by pressing the FORM FEED switch during power-on. After printing 2 hexadecimal digits, 2 characters worth of space is left open. This allows 16 bytes of data per line to be printed.

Printing is initiated after 16 bytes of data is input. If the input data is less than 16 bytes, pressing the ON-LINE switch prints the input data. After this printing is done, the OFF-LINE state is set. Pressing the ON-LINE switch once more sets the hexadecimal dump function. The characters to be printed are set to Pica Character mode. Near Letter Quality Character mode can be set by pressing the NLQ switch in the OFF-LINE state.

The hexadecimal dump list function can be terminated by turning the printer off and then on.


# ⎯ERROR⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

The printer enters an error state in the following conditions:

i)  If an internal RAM error is detected during the initialization process.
ii)  If the home position is not detected during the home detection process.

The PAPER OUT lamp then flickers to indicate an error. The flickering cycle is shown below.

- Case i)

| 100 ms | 100 ms | 300 ms | 300 ms | ON: PAPER OUT lamp is ON and buzzer sounds. |
| | | | | OFF: PAPER OUT lamp is OFF and buzzer does not sound. |

This pattern is repeated

- Case ii)

| 300 ms | 300 ms | ..... ON: PAPER OUT lamp is ON and buzzer sounds. |
| | | ..... OFF: PAPER OUT lamp is OFF and buzzer does not sound. |

This pattern is repeated.
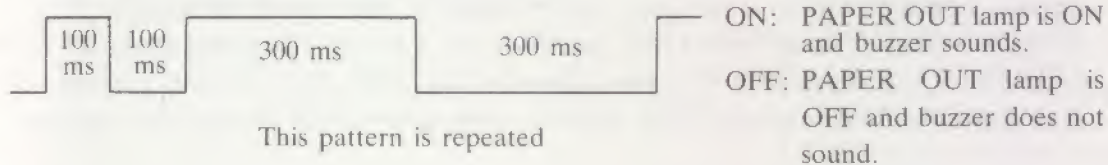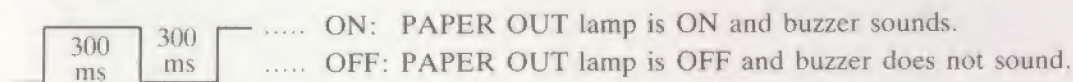
To end an error state, turn power OFF and ON again.

# ⎯CONTROL CODE EXPLANATIONS⎯⎯⎯⎯⎯⎯

\* The following are Applesoft BASIC program examples.

## ● Print Command

1. ⎡CR⎤ (CONTROL-M)     (0D) Hex (13) Decimal

Input of this code initiates printing. The print data that is input after this code is printed from the left margin. DIP switch 1-8 for the CR function code determines whether a line feed is performed after printing.

**Note:** The CHR$(13) command of Applesoft BASIC outputs both the ⎡CR⎤ and ⎡LF⎤ codes to the printer.

```
PROGRAM ONE
PROGRAM TWO

   10   PRINT   CHR$ (4);"PR#1"
   20   PRINT "PROGRAM ONE";
   30   PRINT   CHR$ (13);
   40   PRINT "PROGRAM TWO"
   50   LIST
   60   PRINT   CHR$ (4);"PR#0"
```

## ● Line Feed

2. ⎡LF⎤ (CONTROL-J)     (0A) H (10) D

Input of this code performs a line feed. If this is designated as a print command by DIP switch 2-2, a line feed is performed after printing. When the printer is in the reverse line feed mode, a line feed is performed in the reverse direction.
When a VFU (Vertical Form Unit) has been set, a forward line feed from the BOF (bottom of form) position advances paper to the TOF (top of form) position and a reverse line feed from the TOF position feeds paper back to the BOF position.

```
PROGRAM ONE
PROGRAM TWO

   10   PRINT   CHR$ (4);"PR#1"
   20   PRINT "PROGRAM ONE";
   30   PRINT   CHR$ (10);
   40   PRINT "PROGRAM TWO"
   50   LIST
   60   PRINT   CHR$ (4);"PR#0"
```

22

**Limited area allowed to perform reverse line feeds.**

\* Reverse line feed accuracy is not guaranteed.

● Cut Sheet                                              ● Continuous Forms
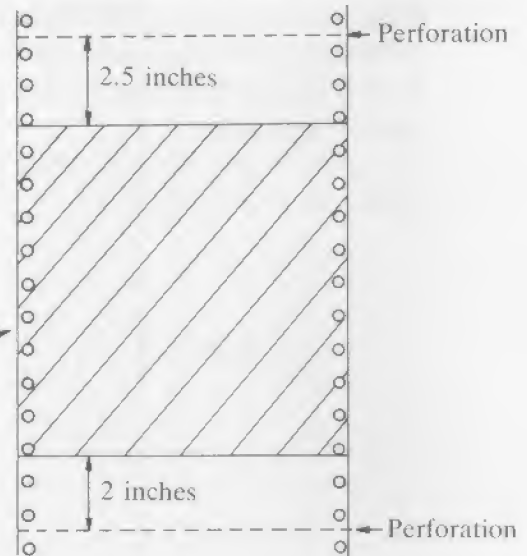


**Note:** When using the tractor unit for continuous forms, maximum 2 reverse line feeds can be performed within the above limited area.

● **Vertical Tab**

3. $\boxed{\text{VT}}$ (CONTROL-K)      (0B)H (11)D

Input of this code performs a paperfeed until the next vertical tab B. If this is designated as a print command, a paperfeed is performed after printing. When the printer is in the reverse line feed mode, a paperfeed is performed in the reverse direction. At power-on, vertical tab Bs are set at every 6th line. For more information about the vertical tab B, refert to "VFU Vertical Tabs".

```
PROGRAM ONE



PROGRAM TWO

10  PRINT  CHR$ (4);"PR#1"
20  PRINT "PROGRAM ONE";
30  PRINT  CHR$ (11);
40  PRINT "PROGRAM TWO"
50  LIST
60  PRINT  CHR$ (4);"PR#0"
```

23

## ● Form Feed

4. [FF] (CONTROL-L)     (0C)H (12)D

Input of this code performs a form feed. If this is designated as a print command, printing is performed and paper advances till the next TOF.

In the reverse line feed mode, paper is fed backward until the top of the previous form is reached.

The page length at power-on is 11 inches (66 lines) or 12 inches (72 lines), as determined by DIP switch 1-4.
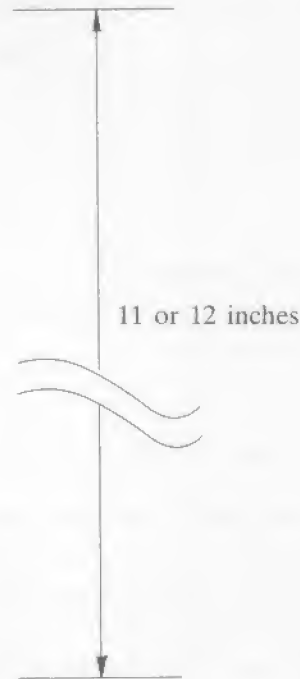
```
PROGRAM ONE                                    11 or 12 inches




PROGRAM TWO

    10   PRINT  CHR$ (4);"PR#1"
    20   PRINT "PROGRAM ONE";
    30   PRINT  CHR$ (12);
    40   PRINT "PROGRAM TWO"
    50   LIST
    60   PRINT  CHR$ (4);"PR#0"
```

## ● Character Mode Designation

5.  [ESC][n]                    (1B, 6E)H (27, 110)D

Input of this command designates the Extended Character mode (9 characters/inch).

```
EXTENDED CHARACTER

10  PRINT  CHR$ (4);"PR#1"
20  PRINT  CHR$ (27);"n";
30  PRINT "EXTENDED CHARACTER"
40  PRINT  CHR$ (27);"E";
50  LIST
60  PRINT  CHR$ (4),"PR#0"
```

6.  [ESC][N]                    (1B, 4E)H (27, 78)D

Input of this command designates the Pica Character mode (10 characters/inch).

```
PICA CHARACTER

10  PRINT  CHR$ (4);"PR#1"
20  PRINT  CHR$ (27);"N";
30  PRINT "PICA CHARACTER"
40  PRINT  CHR$ (27);"E";
50  LIST
60  PRINT  CHR$ (4);"PR#0"
```

25

7. `ESC E`                    (1B, 45)H (27, 69)D

Input of this command designates the Elite Character mode (12 characters/inch).

```
ELITE CHARACTER

   10   PRINT  CHR$ (4);"PR#1"
   20   PRINT  CHR$ (27);"E";
   30   PRINT "ELITE CHARACTER"
   40   LIST
   50   PRINT  CHR$ (4);"PR#0"
```

8. `ESC p`                    (1B, 70)H (27, 112)D

Input of this command designates the Pica Proportional Character mode (144 dots/inch).

```
PICA PROPORTIONAL CHARACTER

   10   PRINT  CHR$ (4);"PR#1"
   20   PRINT  CHR$ (27);"p";
   30   PRINT "PICA PROPORTIONAL CHARACTER"
   40   PRINT  CHR$ (27);"E";
   50   LIST
   60   PRINT  CHR$ (4);"PR#0"
```

9. ☐ESC☐P☐                    (1B, 50)H  (27, 80)D

Input of this command designates the Elite Proportional Character mode (160 dots/inch).

```
ELITE PROPORTIONAL CHARACTER

10  PRINT  CHR$ (4);"PR#1"
20  PRINT  CHR$ (27);"P";
30  PRINT "ELITE PROPORTIONAL CHARACTER"
40  PRINT  CHR$ (27);"E";
50  LIST
60  PRINT  CHR$ (4);"PR#0"
```

10. ☐ESC☐e☐                    (1B, 65)H  (27, 101)D

Input of this command designates the Semicondensed Character mode (13.4 characters/inch).

```
SEMICONDENSED CHARACTER

10  PRINT  CHR$ (4);"PR#1"
20  PRINT  CHR$ (27);"e";
30  PRINT "SEMICONDENSED CHARACTER"
40  PRINT  CHR$ (27);"E";
50  LIST
60  PRINT  CHR$ (4);"PR#0"
```

11.  | ESC | q |                    (1B, 71)H  (27, 113)D

Input of this command designates the Condensed Character mode (15 characters/
inch).

```
CONDENSED CHARACTER

10   PRINT  CHR$ (4),"PR#1"
20   PRINT  CHR$ (27);"q";
30   PRINT "CONDENSED CHARACTER"
40   PRINT  CHR$ (27);"E";
50   LIST
60   PRINT  CHR$ (4);"PR#0"
```

12.  | ESC | Q |                    (1B, 51)H  (27, 81)D

Input of this command designates the Ultracondensed Character mode (17 characters/
inch).

```
ULTRACONDENSED CHARACTER

10   PRINT  CHR$ (4);"FR#1"
20   PRINT  CHR$ (27);"Q";
30   PRINT "ULTRACONDENSED CHARACTER"
40   PRINT  CHR$ (27);"E";
50   LIST
60   PRINT  CHR$ (4);"PR#0"
```

● **Bold Print**

13. ┌─────┐
    │ ESC │ ! │          (1B, 21)H  (27, 33)D
    └─────┘

Input of this command designates the Bold print mode.
In this mode, the print head moves half a dot to the right to re-print the same charac-
ter. The bold mode is valid in all print modes, such as double-width, graphics, and
underlining.



```
          Standard                    Bold
```
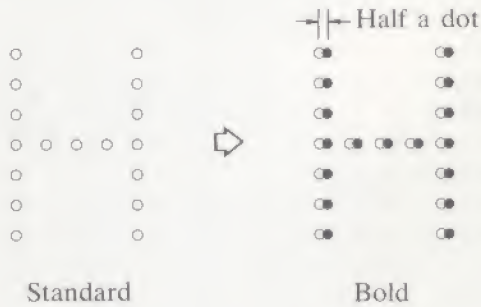
```
BOLD PRINTING
NORMAL PRINTING

10   PRINT   CHR$ (4);"PR#1"
20   PRINT   CHR$ (27);"!";
30   PRINT "BOLD PRINTING"
40   PRINT   CHR$ (27); CHR$ (34);
50   PRINT "NORMAL PRINTING"
60   LIST
70   PRINT   CHR$ (4);"PR#0"
```

14. ┌─────┐
    │ ESC │ " │          (1B, 22)H  (27, 34)D
    └─────┘

This command terminates the Bold print mode.


Refer to 13.

## • Double-Width Print

15. [SO] (CONTROL-N)     (0E)H (14)D

Input of this command designates the Double-Width print mode, which is valid for all modes including graphics. The number of characters per inch is reduced to a half in this mode.

```
DOUBLE WIDTH PRINTING
NORMAL PRINTING

10   PRINT  CHR$ (4);"PR#1"
20   PRINT  CHR$ (14);
30   PRINT "DOUBLE WIDTH PRINTING"
40   PRINT  CHR$ (15);
50   PRINT "NORMAL PRINTING"
60   LIST
70   PRINT  CHR$ (4);"PR#0"
```

16. [SI] (CONTROL-O)     (0F)H (15)D

This command terminates the Double Width print mode.

Refer to 15.

## • Near Letter Quality Character

17. ESC H          (1B, 48)H (27, 72)D

Input of this command designates the Near Letter Quality Character mode (NLQ), which is valid for only the Extended, Pica, Elite, Pica Proportional, and Elite Proportional character modes. This mode has double dot-density in both vertical and horizontal directions when compared with standard characters.

This command is invalid in the Superscript/Subscript and Graphics modes.

```
NEAR LETTER QUALITY
NORMAL PRINTING

10   PRINT  CHR$ (4);"PR#1"
20   PRINT  CHR$ (27);"H";
30   PRINT "NEAR LETTER QUALITY"
40   PRINT  CHR$ (27);"h";
50   PRINT "NORMAL PRINTING"
60   LIST
70   PRINT  CHR$ (4);"PR#0"
```

18. ESC h          (1B, 68)H (27, 104)D

This command terminates the Near Letter Quality Character mode.

Refer to 17.

- **Italic Character**

19. ESC i 1           (1B, 69, 31)H (17, 105, 49)D

Input of this command selects the Italic Character mode, which is valid for all modes except the Graphics and Superscript/Subscript Character modes.
When the Superscript/Subscript and Italic Character modes are set simultaneously the last mode set is given priority. If the mode set last is terminated, the other becomes valid.

```
ITALIC CHARACTER
NORMAL PRINTING

10  PRINT  CHR$ (4);"PR#1"
20  PRINT  CHR$ (27);"i1";
30  PRINT "ITALIC CHARACTER"
40  PRINT  CHR$ (27);"i0";
50  PRINT "NORMAL PRINTING"
60  LIST
70  PRINT  CHR$ (4);"PR#0"
```

20. ESC i 0           (1B, 69, 30)H (27, 105, 48)D

This command terminates the Italic Character mode.

Refer to 19

## • Superscript/Subscript Character

21. |ESC|b|0|               (1B, 62, 30)H (27, 98, 48)D

This command terminates the Superscript/Subscript Character mode. The Superscript/
Subscript Character mode condenses a character to 1/2 its original height. The
Superscript/Subscript designation is valid for all the modes except the Near Letter
Quality, Italic, and Graphics print modes. In the Near Letter Quality Character
mode, the Superscript/Subscript Character mode is given priority if it is input.

22. |ESC|b|1|               (1B, 62, 31)H (27, 98, 49)D

Input of this command designates the Superscript Character mode.

```
X²+X=Y

10  PRINT  CHR$ (4);"PR#1"
20  PRINT "X";
30  PRINT  CHR$ (27);"b1";
40  PRINT "2";
50  PRINT  CHR$ (27);"b0";
60  PRINT "+X=Y"
70  LIST
80  PRINT  CHR$ (4);"PR#0"
```

23. |ESC|b|2|               (1B, 62, 32)H (27, 98, 50)D

Input of this command designates the Subscript Character mode.

```
H₂0

10  PRINT  CHR$ (4);"PR#1"
20  PRINT "H";
30  PRINT  CHR$ (27);"b2";
40  PRINT "2";
50  PRINT  CHR$ (27);"b0";
60  PRINT "0"
70  LIST
80  PRINT  CHR$ (4);"PR#0"
```

33

## • Underlining

24. ESC X          (1B, 58)H (27, 88)D

Input of this command starts underlining that is valid for all the modes, including the Graphics mode.

```
AAAAABBBBBCCCCC

10  PRINT  CHR$ (4);"PR#1"
20  PRINT "AAAAA";
30  PRINT  CHR$ (27);"X";
40  PRINT "BBBBB";
50  PRINT  CHR$ (27);"Y";
60  PRINT "CCCCC"
70  LIST
80  PRINT  CHR$ (4);"PR#0"
```

25. ESC Y          (1B, 59)H (27, 89)D

Input of this command terminates underlining.

Refer to 24.

## • Dot Spacing in Proportional

26. |ESC|n|                    (1B, 31~36)H (27, 49~54)D

Input of this command leaves an additional n dots of space between given proportional characters. n is in the range of 1 to 6 dots. In the Proportional Character mode, the default dot spacing between characters is 1 dot. If the Double Width Character mode is specified, the number of dot spacing is doubled. This command works only in the Proportional Character mode. Thus, if this command is used in other modes, specify the Proportional Character mode, use this command, and return to the previous mode.

```
DOTSPACE 1
DOTSPACE 2
DOTSPACE 3
DOT SPACE 4
DOT SPACE 5
DOT SPACE 6

 10   PRINT  CHR$ (4),"PR#1"
 20   PRINT  CHR$ (27);"P";
 30   FOR I = 1 TO 6
 40   PRINT "DOT"; CHR$ (27),I,
 50   PRINT "SPACE"; CHR$ (27),I;
 60   PRINT I
 70   NEXT I
 80   PRINT  CHR$ (27);"E";
 90   LIST
100   PRINT  CHR$ (4),"PR#0"
```

27.  $\boxed{\text{ESC}\,|\,\text{s}\,|\,\text{n}}$              (1B, 73, 30~39)H  (27, 115, 48~57)D

Input of this command leaves an additional n dots of space between all proportional characters.

n is in the range of 0 to 9 dots.

The rest is the same as the $\boxed{\text{ESC}\,|\,\text{n}}$ command.

```
DOT SPACE0
DOT SPACE1
DOT SPACE2
DOT SPACE3
DOT SPACE4
DOT SPACE5
DOT SPACE6
DOT SPACE7
DOT SPACE8
DOT SPACE9

10  PRINT  CHR$ (4);"PR#1"
20  PRINT  CHR$ (27);"P";
30  FOR I = 0 TO 9
40  PRINT  CHR$ (27);"s";I,
50  PRINT "DOT SPACE";I
60  NEXT I
70  PRINT  CHR$ (27);"E";
80  LIST
90  PRINT  CHR$ (4);"PR#0"
```

● **Backspacing**

28.  $\boxed{\text{BS}}$ (CONTROL-H)     (08)H  (8)D

This command enables overlapped printing of characters such as ± and ¢. This command is valid for only one character and cannot be used continuously.

```
--------+|||||||||

10  PRINT  CHR$ (4);"PR#1"
20  PRINT "---------";
30  PRINT  CHR$ (8);
40  PRINT "|||||||||||"
50  PRINT  CHR$ (27);"E";
60  LIST
70  PRINT  CHR$ (4);"PR#0"
```

## • Horizontal Tab

29. HT (CONTROL-I)　　(09)H (9)D

This command moves the print head to the next tab position. No tab is set at power-on, or by the input of software reset command.

This command is ignored when there is no tab position between the current print position and the end of the line.

When performing a horizontal tab, the printer prints out the data already received.

30. ESC ( n n n, ... , m m m.　　(1B, 28)H (27, 40)D

This command sets the horizontal tab. The maximum number of horizontal tab settings is 32.

n n n and m m m are 3-digit ASCII numerals separated by commas. The numbers specify the tab positions in character units, starting from the left margin. The command ends with a period.

The character pitch determines the maximum tab position that can be specified.

| Character | Maximum Tab Position |
|---|---|
| Extended | 72 |
| Pica | 80 |
| Elite | 96 |
| Pica Proportional | 72 |
| Elite Proportional | 80 |
| Semicondensed | 107 |
| Condensed | 120 |
| Ultracondensed | 136 |

Tab positions are based on the current character pitch.

If the character pitch or the left margin is changed, the absolute tab positions already set remain unchanged.

31.  `ESC` `u` `n` `n` `n`          (1B, 75)H (27, 117)D

This command adds only one tab at a time to the original tab setup. `n` `n` `n` is a 3-digit ASCII numeral.


32.  `ESC` `)` `n` `n` `n` `,` `...` `,` `m` `m` `m` `.`    (1B, 29)H (27, 41)D

This command clears the horizontal tabs individually. The rest is the same as the `ESC` `(` command.


33.  `ESC` `0`          (1B, 30)H (27, 48)D

This command clears all horizontal tabs.

## • Margin Setting

34. |ESC|L|n|n|n|          (1B, 4C)H (27, 76)D

This command sets the left margin to character position |n|n|n| in the present
character width units. When in the Elite Proportional or Pica Proportional mode,
1/10″ or 1/9″ are, respectively, used as the character width to set margin positions.
|n|n|n| is a 3-digit ASCII numeral. At power-on, the print head stays at the home
position (called position 0).
For example, the code |ESC|L|0|0|4| sets the left margin to the 5th character
position.

```
LEFT MARGIN SETTING
    5TH CHARACTER POSITION

10   PRINT  CHR$ (4);"PR#1"
20   PRINT "LEFT MARGIN SETTING"
30   PRINT  CHR$ (27),"L004";
40   PRINT "5TH CHARACTER POSITION"
50   PRINT  CHR$ (27),"L000";
60   LIST
70   PRINT  CHR$ (4);"PR#0"
```

35. |ESC|/|n|n|n|          (1B, 2F)H (27, 47)D

Input of this command sets the right margin to character position |n|n|n|.
The left and right margin positions remain unchanged until either another command
is input or the power is turned off. Changing the character pitch does not alter the
margin positions already set.
The margin set command is ignored when the distance between the left and right
margins is less than the width of 4 Extended characters.

```
RIGHT MARGIN SETTING
612345678901234567890123 4

10   PRINT  CHR$ (4);"PR#1"
20   PRINT "RIGHT MARGIN SETTING"
30   PRINT  CHR$ (27),"/025";
40   PRINT "012345678901234567890012345"
50   PRINT  CHR$ (27),"/096"
60   LIST
70   PRINT  CHR$ (4);"PR#0"
```

## ● Printing Direction

36.  ESC > (1B, 3E)H (27, 62)D

Input of this command prints all subsequent data from left to right. Slight vertical misalignment can be avoided by using this unidirectional print function.

```
UNIDIRECTIONAL PRINTING
----------------------->
----------------------->
----------------------->
BIDIRECTIONAL PRINTING
----------------------->
<----------------------
----------------------->

10   PRINT  CHR$ (4);"PR#1"
20   PRINT  CHR$ (27);">",
30   PRINT "UNIDIRECTIONAL PRINTING"
40   PRINT "----------------------->"
50   PRINT "----------------------->"
60   PRINT "----------------------->"
70   PRINT  CHR$ (27);"<";
80   PRINT "BIDIRECTIONAL PRINTING"
90   PRINT "----------------------->"
100   PRINT "<----------------------"
110   PRINT "----------------------->"
120   LIST
130   PRINT  CHR$ (4);"PR#0"
```

37.  ESC < (1B, 3C)H (27, 60)D

Input of this command designates the bidirectional print function. This function remains in effect until terminated.

Refer to 36.

## ● Character Repetition

38.  ESC R n n n C (1B, 52)H (27, 82)D

This command prints a given character designated by C n n n times continuously. n n n is a 3-digit ASCII numeral (maximum number is 999).

```
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

10   PRINT  CHR$ (4);"PR#1"
20   PRINT  CHR$ (27);"R035"; CHR$ (33)
30   LIST
40   PRINT  CHR$ (4);"PR#0"
```

40

## • Line Feed Pitch

39. ESC A            (1B, 41)H (27, 65)D

Input of this command designates a line feed value of 1/6 inch. Line feed pitch is automatically selected at power-on.

```
LINE FEED1
LINE FEED2
LINE FEED3
LINE FEED4
LINE FEED5
LINE FEED6

10   PRINT  CHR$ (4),"PR#1"
20   PRINT  CHR$ (27),"A";
30   FOR I = 1 TO 6
40   PRINT "LINE FEED";I
50   NEXT I
60   LIST
70   PRINT  CHR$ (4),"PR#0"
```

40. ESC B            (1B, 42)H (27, 66)D

The line feed value is designated as 1/8 inch.

```
LINE FEED1
LINE FEED2
LINE FEED3
LINE FEED4
LINE FEED5
LINE FEED6

10   PRINT  CHR$ (4),"PR#1"
20   PRINT  CHR$ (27),"B";
30   FOR I = 1 TO 6
40   PRINT "LINE FEED";I
50   NEXT I
60   PRINT  CHR$ (27),"A";
70   LIST
80   PRINT  CHR$ (4),"PR#0"
```

41. | ESC | T | n | n |        (1B, 54) H  (27, 84) D

                              $1 \leq n \leq 99$

Input of this command designates a line feed value of nn/144 inch. The vertical dot pitch is 1/72 of an inch, so this command allows line feeding of half a dot pitch. In graphics printing, the | ESC | T | 1 | 6 | command draws a continuous vertical line. The line feed pitch remains unchanged until either another line feed pitch command is input or the power is turned off.

```
LINE FEED19/144INCHES
LINE FEED32/144INCHES
LINE FEED45/144INCHES

LINE FEED58/144INCHES


LINE FEED71/144INCHES



LINE FEED84/144INCHES



LINE FEED97/144INCHES
```

```
10 PRINT CHR$ (4);"PR#1"
20 FOR I = 19 TO 99 STEP 13
30 PRINT CHR$ (27);"T";I;
40 PRINT "LINE FEED";I"/144INCHES"
50 NEXT I
60 PRINT CHR$ (27);"A";
70 LIST
80 PRINT CHR$ (4);"PR#0"
```

## • Line Feed Direction

42. ESC f                    (1B, 66)H (27, 102)D

Input of this command designates forward (normal) line feeding. Forward line
feeding is automatically selected at power-on.

```
++++++++++++++++++
---++++++++++++---
------++++-+------

10   PRINT  CHR$ (4),"PR#1"
20   PRINT  CHR$ (27),"r";
30   PRINT "------------------"
40   PRINT "------------------"
50   PRINT "------------------"
60   PRINT  CHR$ (27),"f"
70   PRINT "||||||||||||||||||"
80   PRINT "   ||||||||||||    "
90   PRINT "       |||||       "
100  LIST
110  PRINT  CHR$ (4),"PR#0"
```

43. ESC r                    (1B, 72)H (27, 114)D

This command selects reverse line feeding.
Pressing the LF and FF switches advances paper only in the forward direction, even
when this command has been input.
Refer to the "Limited area allowed to perform reverse line feeds" on page 23.

43

## • VFU Vertical Tabs

Under Vertical Form Unit (VFU) control, up to 96 vertical tab positions can be set on a page.

Vertical tabs can be set on each line for 5 different channels B, C, D, E, and F. Thus, 5 separate vertical tab patterns can be used simultaneously. A 2-character code is needed to set vertical tabs on one line.

A structure of vertical tab settings follows:

```
Line  1            TOF
Line  2
  ⋮
                       Any combination of 5 different channel tabs can be
                       specified in between TOF and BOF.
Line  n−1
Line  n            BOF
Line  n+1
  ⋮
                       Fill out with no-tab codes
Line  m
Line  m+1          TOF of next form
```
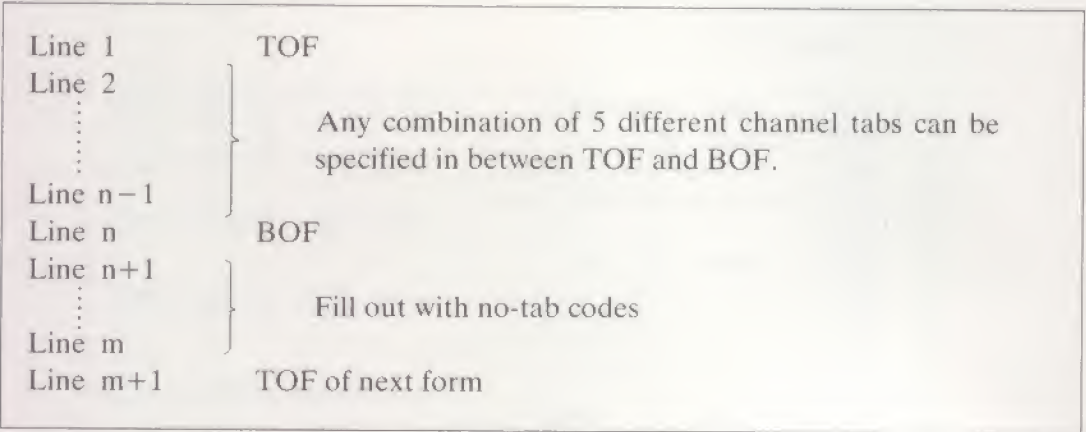
The page length also changes accordingly if VFU vertical tabs are set.

44. ⌷GS⌷ (CONTROL-]) ⌷A⌷ ⌷@⌷ (1D, 41, 40) H (29, 65, 64) D

Input of this command starts vertical tab settings, or sets top of form (TOF).
Here is an example to create a vertical tab structure of a 7-line form, with pages 9
lines long.

| Line | 1: | TOF |
|------|----|-----|
| Line | 2: | No tabs |
| Line | 3: | Tabs B and C |
| Line | 4: | No tabs |
| Line | 5: | Tabs C, D and E |
| Line | 6: | No tabs |
| Line | 7: | BOF |
| Line | 8: | No tabs |
| Line | 9: | No tabs |
| Line | 10: | TOF, next form |

Use the following codes to send these vertical tab positions to the printer:

(CONTROL-])                                                              (CONTROL-^)

GS A @   @ @   F @   @ @   \ @   @ @   C @   @ @   @ @   A @ RS
Line  1      2      3      4      5      6      7      8      9      10

```
1ST LINE                        10  PRINT  CHR$ (4);"PR#1"
                                20  PRINT  CHR$ (29);"A@";
3RD LINE TAB B                  30  PRINT "@@";
                                40  PRINT "F@";
5TH LINE TAB E                  50  PRINT "@@";
                                60  PRINT "\@";
                                70  PRINT "@@";
                                80  PRINT "C@";
                                90  PRINT "@@";
BOTTOM LINE                     100 PRINT "@@";
                                110 PRINT "A@"; CHR$ (30);
                                120 REM  VERTICAL FORM UNIT
                                130 PRINT "1ST LINE"; CHR$ (13);
NEXT PAGE 1ST LINE              140 PRINT  CHR$ (31);"B";
                                150 PRINT "3RD LINE TAB B"; CHR$ (13);
                                160 PRINT  CHR$ (31);"E";
                                170 PRINT "5TH LINE TAB E"; CHR$ (13);
                                180 PRINT  CHR$ (31);"C";
                                190 PRINT "BOTTOM LINE"; CHR$ (13);
                                200 PRINT  CHR$ (31);"D";
                                210 PRINT "NEXT PAGE 1ST LINE"
                                220 PRINT  CHR$ (29);"O";
                                230 LIST
                                240 PRINT  CHR$ (4);"PR#0"
```

45

45. $\boxed{C}\ \boxed{@}$          (43, 40)H (67, 64)D

Input of this command sets bottom of form (BOF).

      Refer to 44.

46. $\boxed{A}\ \boxed{@}\ \boxed{RS}$ (CONTROL-^)     (41, 40, 1E)H (65, 64, 30)D

Input of this command terminates vertical tab settings, or sets TOF of next form.

      Refer to 44.

The following 2-character codes are used to set any combination of tab stops for the 5 channels.

| Code | Hex | Decimal | Function |
|------|-----|---------|----------|
| @@ | 40  40 | 64  64 | Sets no  tabs |
| B@ | 42  40 | 66  64 | Sets tab  B |
| D@ | 44  40 | 68  64 | Sets tab  C |
| H@ | 48  40 | 72  64 | Sets tab  D |
| P@ | 50  40 | 80  64 | Sets tab  E |
| ,@ | 60  40 | 96  64 | Sets tab  F |
| F@ | 46  40 | 70  64 | Sets tabs  B, C |
| J@ | 4A  40 | 74  64 | Sets tabs  B, D |
| R@ | 52  40 | 82  64 | Sets tabs  B, E |
| b@ | 62  40 | 98  64 | Sets tabs  B, F |
| L@ | 4C  40 | 76  64 | Sets tabs  C, D |
| T@ | 54  40 | 84  64 | Sets tabs  C, E |
| d@ | 64  40 | 100  64 | Sets tabs  C, F |
| X@ | 58  40 | 88  64 | Sets tabs  D, E |
| h@ | 68  40 | 104  64 | Sets tabs  D, F |
| p@ | 70  40 | 112  64 | Sets tabs  E, F |
| N@ | 4E  40 | 78  64 | Sets tabs  B, C, D |
| V@ | 56  40 | 86  64 | Sets tabs  B, C, E |
| f@ | 66  40 | 102  64 | Sets tabs  B, C, F |
| Z@ | 5A  40 | 90  64 | Sets tabs  B, D, E |
| j@ | 6A  40 | 106  64 | Sets tabs  B, D, F |
| r@ | 72  40 | 114  64 | Sets tabs  B, E, F |
| \@ | 5C  40 | 92  64 | Sets tabs  C, D, E |
| ℓ@ | 6C  40 | 108  64 | Sets tabs  C, D, F |
| t@ | 74  40 | 116  64 | Sets tabs  C, E, F |
| x@ | 78  40 | 120  64 | Sets tabs  D, E, F |
| ^@ | 5E  40 | 94  64 | Sets tabs  B, C, D, E |
| n@ | 6E  40 | 110  64 | Sets tabs  B, C, D, F |
| v@ | 76  40 | 118  64 | Sets tabs  B, C, E, F |
| z@ | 7A  40 | 122  64 | Sets tabs  B, D, E, F |
| |@ | 7C  40 | 124  64 | Sets tabs  C, D, E, F |
| ~@ | 7E  40 | 126  64 | Sets tabs  B, C, D, E, F |

## • Using Vertical Tabs

47.  [US] (CONTROL-__) [A]-[F]     (1F, 41~46)H (31, 65~70)D

Note that CONTROL-__ is CONTROL-underline.

    US  A       Moves to next BOF or TOF
    US  B       Moves to next tab B position  (Same as the [VT] code, (0B)H)
    US  C       Moves to next tab C position
    US  D       Moves to next tab D position
    US  E       Moves to next tab E position
    US  F       Moves to next tab F position

These commands perform printing if DIP switch 2-2 is set to on.

If the line feed direction is reversed, the vertical tab structure is reversed with respect to the paper. If the line feed pitch is changed after the tabs have been set, the entire format also changes accordingly because vertical tabs are counted in line units. When there is no tab setting in the remaining part of a form, a paperfeed is performed until the next TOF.

Refer to 44.

## • Vertical Tab Initialization

48.  [GS] [0]                    (1D, 30)H (29, 48)D

Input of this command sets vertical tabs to power-on state and sets the TOF at the current position.
At power-on, the page length is either 66 or 72 lines, depending on DIP switch 1-4. B tabs are automatically set for every 6th line. No other tabs are set.

Refer to 44.

## ● Multiple Linefeeds

49.  | US | n |                    (1F)H  (31)D

Input of this command advances paper by n (1 ~ 15) lines in the current line feed direction.

The following ASCII numerals and symbols designate a number of lines:

| n (Hex) | 1 (31) | 2 (32) | 3 (33) | 4 (34) | 5 (35) | 6 (36) | 7 (37) | 8 (38) | 9 (39) | : (3A) | ; (3B) | < (3C) | = (3D) | > (3E) | ? (3F) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of lines | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |

```
1ST LINE



8TH LINE

10  PRINT  CHR$ (4),"PR#1"
20  PRINT "1ST LINE";
30  PRINT  CHR$ (31),"7";
40  PRINT "8TH LINE"
50  LIST
60  PRINT  CHR$ (4),"PR#0"
```

## • TOF Setting

50.  `ESC` `v`  (1B, 76)H (27, 118)D

Input of this command sets the TOF at the current print head position.
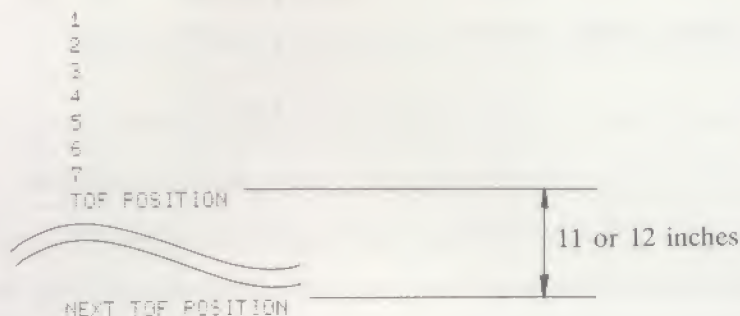
```
1
2
3
4
5
6
7
TOF POSITION
                                              11 or 12 inches
NEXT TOF POSITION

10  PRINT  CHR$ (4);"PR#1"
20  FOR I = 1 TO 7
30  PRINT I
40  NEXT I
50  PRINT  CHR$ (27);"v";
60  PRINT "TOF POSITION"  CHR$ (12);
70  PRINT "NEXT TOF POSITION"
80  LIST
90  PRINT  CHR$ (4);"PR#0"
```

## • Download Character

Special characters defined by the user are called Download characters.
A maximum of 175 download characters can be defined and stored in the RAM area.
The contents of the RAM are lost if the power is turned off.
To use the Download characters, change from the normal character set in the ROM to the Download character set in the RAM by inputting a control code. Download characters, as well as normal characters, can be expanded, contracted, underlined, and printed in the bold and double width modes.

Print Head Pins (Vertically spaced 1/72″ apart)

```
TOP   PIN 1  ○ ┐──→ Pins 1 to 7 are used for capital letters.
          2  ○
          3  ○
          4  ○  ──→Pins 3 to 7 are for lower-case letters, with pins 8 and
          5  ○       9 used for descenders, such as y, g and q.
          6  ○
          7  ○ ┘
          8  ○
BOTTOM PIN 9  ○ ┘──→ Pin 9 is used for underlining, as well.
```
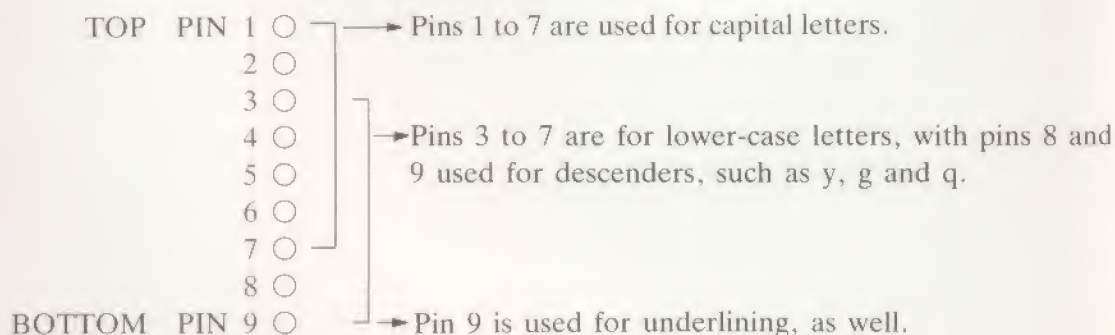
## • Download Character Loading

51. [ESC] [-]                  (1B, 2D)H  (27, 45)D

This command specifies that the maximum horizontal width is 8 dots.

52. [ESC] [+]                  (1B, 2B)H  (27, 43)D

This command specifies that the maximum horizontal width is 16 dots.

53. [ESC] [I]                  (1B, 49)H  (27, 73)D

Input of this command starts loading new download characters.

54. [EOT] (CONTROL-D)  (04)H  (4)D

This command terminates new characters loading.

**Note:** Applesoft Basic for the Apple IIc does not output this code to the printer with the CHR$(4) command.

55. [A] ~ [P]                  (41, 42, ..., 50)H  (65, 66, ..., 80)D

This code is the width code to designate a number of horizontal dots when using the top 8 pins.
(A = 1, B = 2, ..., P = 16)

56. $\boxed{a} \sim \boxed{p}$                   (61, 62, ..., 70) H (97, 98, ..., 112) D

This code is the width code to designate a number of horizontal dots when using the bottom 8 pins.
(a = 1, b = 2, ..., p = 16)

Follow the steps below to store Download characters into the RAM:

Step 1.     Input the $\boxed{ESC}\boxed{-}$ or $\boxed{ESC}\boxed{+}$ to select a maximum width of 8 or 16 dots. The RAM can store fewer characters if a maximum of 16 dots is selected.

Step 2.     Input the $\boxed{ESC}\boxed{I}$ to the printer to start new characters loading.

Step 3.     Input the following information for EACH new character.

         i. Send the regular character code to be assigned as a new character. When the maximum width of 16 dots is selected, the codes that can be assigned are in the range of (20) H to (7E) H, or 32 to 126. When the width up to 8 dots is selected, the codes in the range of (A0) H to (EF) H, or 160 to 239, can also be assigned in addition to the above codes.

         ii. Send a width code. If the new character is 8 dots wide and uses the top 8 pins, send "H"; if it is 14 dots wide and uses the top 8 pins, send "N"; if it is 7 dots wide and uses the bottom 8 pins, send "g".

         iii. Send the specified number of binary character data in the order from the left to the right dot column. The least-significant bit (bit 0) of each number corresponds to the top pin, and the most-significant bit (bit 7) corresponds to the bottom pin. Refer to Appendix C for ASCII characters that correspond to binary numbers.

Step 4.     After repeating step 3 above for each new character, send the $\boxed{EOT}$ (CONTROL-D) to terminate the loading.

Here is an example to load character α:

Dot Column
1 2 3 4 5 6 7 8 9

PIN 1

PIN 8
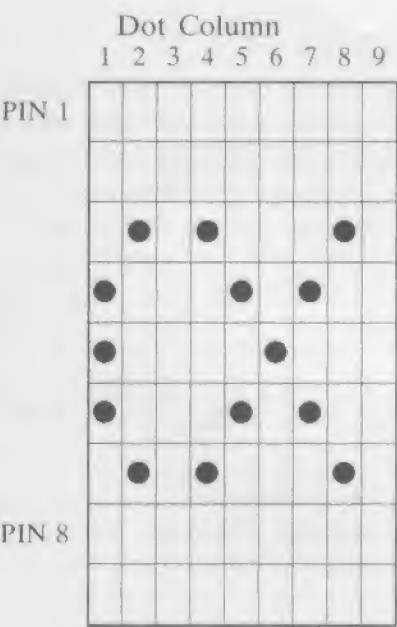
| Dot Column | Binary | ASCII Character |
|------------|----------|----------------------|
| 1 | 00111000 | 8 |
| 2 | 01000100 | D |
| 3 | 00000000 | NUL (CONTROL-@) |
| 4 | 01000100 | D |
| 5 | 00101000 | ( |
| 6 | 00010000 | (CONTROL-P) |
| 7 | 00101000 | ( |
| 8 | 01000100 | D |
| 9 | 00000000 | NUL (CONTROL-@) |

Assume that character "#" indicates the above new character 'α'.

The loading sequence is:

ESC + ESCI # I 8 D CONTROL-@ D ( CONTROL-P ( D CONTROL-@ CONTROL-D

Start

Maximum
16 dots wide

9 dots wide,
top 8 pins

Dot column 1-9

Stop

53
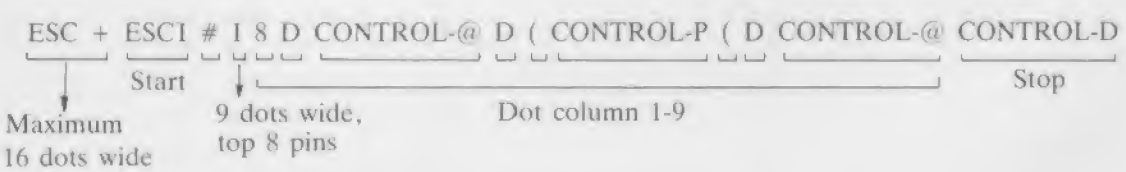
## • Download Character Printing

57. ⬜ESC⬜'⬜          (1B, 27)H  (27, 39)D

Input of this command switches to the download character set. The download characters in the range of 32 through 126 can be used in both the 8-dot and 16-dot maximum modes. The download characters in the range of 160 through 239 can also be used if they have been loaded in the 8-dot maximum mode.

58. ⬜ESC⬜✻⬜          (1B, 2A)H  (27, 42)D

Input of this command switches to the download character set of high ASCII values (160-239) that are reassigned to ASCII 32 through 111.
The 7-bit mode must have been set before inputting this command.
In the 8-bit mode, this command switches back to the normal character set.

59. ⬜ESC⬜$⬜          (1B, 24)H  (27, 36)D

Input of this command switches back to the normal character set.

## • Graphics

60. | ESC | G | n | n | n | n |     (1B, 47)H  (27, 71)D

Input of this command designates the graphic printing. | n | n | n | n | are ASCII numer-
al that indicates the number of bytes of graphic data that follow.
A maximum of 1280 horizontal dots per line is permitted and the maximum number
of vertical dots is 8.
A number of horizontal dots per line varies, according to the current standard
character type.
Refer to "APPENDIX B" for maximum dot columns.
The graphic printing is performed unidirectionally from left to right.

The relationship between graphic data and the printed dots is shown below.
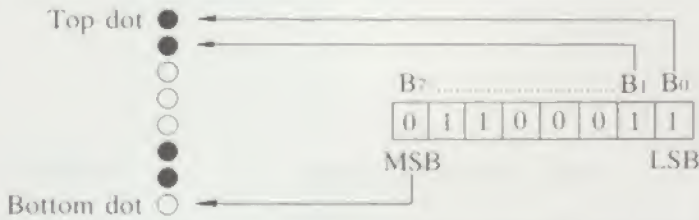


Since the vertical dot pitch is 1/72 inch, specify a line feed pitch of 8/72 (16/144)
inches so that horizontal lines appear vertically connected.



$$2 + 4 + 8 + 64 + 128 = 206$$
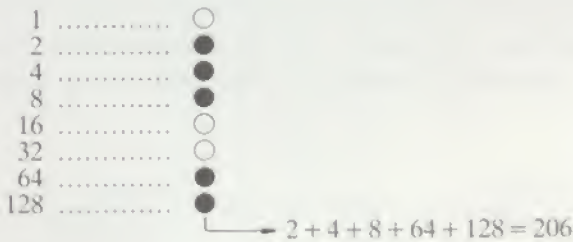


```
10   PRINT   CHR$ (4);"PR#1"
20   PRINT   CHR$ (27);"T16",
30   FOR I = 1 TO 3
40   PRINT   CHR$ (27);"G0020",
50   FOR J = 1 TO 20
60   PRINT   CHR$ (206);
70   NEXT J
80   PRINT   CHR$ (10);
90   NEXT I
100  PRINT   CHR$ (27);"A";
```

61. ESC S n n n n      (1B, 53)H (27, 83)D

Same as the ESC G command.

```
10   PRINT  CHR$ (4);"PR#1"
20   PRINT  CHR$ (27);"S0060",
30   FOR I = 1 TO 60
40   PRINT  CHR$ (187):
50   NEXT I
60   PRINT  CHR$ (10).
70   LIST
80   PRINT  CHR$ (4);"PR#0"
```

62. ESC g n n n      (1B, 67)H (27, 103)D

n n n are ASCII numeral indicating that ( n n n × 8) bytes of graphic data are following ESC g .
The rest is the same as ESC G .
ESC g 0 1 0 is identical to ESC G 0 0 8 0 .

```
10   PRINT  CHR$ (4);"PR#1"
20   PRINT  CHR$ (27),"g009";
30   FOR I = 1 TO 72
40   PRINT  CHR$ (91);
50   NEXT I
60   PRINT  CHR$ (10);
70   LIST
80   PRINT  CHR$ (4),"PR#0"
```

63. ESC V n n n n C (1B, 56)H (27, 86)D

Input of this command prints n n n n repetitions of the graphic dot column
specified by C.

The rest is the same as ESC G .

```
10   PRINT   CHR$ (4);"PR#1"
20   PRINT   CHR$ (27);"V0070",
30   PRINT   CHR$ (83);
40   PRINT   CHR$ (10),
50   LIST
60   PRINT   CHR$ (4);"PR#0"
```

● **Print Position**

64. ESC F n n n n        (1B, 46)H (27, 70)D

Input of this command begins printing at the dot column n n n n away from the
left margin position. n n n n are ASCII numerals. The horizontal dot pitch is
identical to the pitch of the current print mode in effect. If the dot position specified is
located at the left side of the current dot position, this command is ignored. When
performing this command, the printer prints out the data already received.

```
01234567890123456789012345678ö
                   PRINT POSITION

10   PRINT   CHR$ (4);"PR#1"
20   PRINT   "01234567890123456789012345678ö"
30   PRINT   CHR$ (27);"F0149",
40   PRINT   "PRINT POSITION"
50   LIST
60   PRINT   CHR$ (4);"PR#0"
```

## ● Paper-Out Detector

65. ESC O           (1B, 4F)H (27, 79)D

Input of this command disables the paper-out detector and allows the printer to continue printing, even after it runs out of paper.

66. ESC o           (1B, 6F)H (27, 111)D

This command enables the paper-out detector.

When the automatic paper ejection is disabled by turning DIP switch 2-4 off and less than 1 inch of paper remains, the PAPER OUT lamp lights, the ON-LINE lamp goes off, and the printer is deselected.

Pressing the ON-LINE switch turns on the ON-LINE lamp and prepares the printer to receive data. The printer enters the paper-out state again after a print and line feed.

When the automatic paper ejection is enabled by the ESC D 00 08 command, the printer enters the paper-out state after ejecting the paper.

## ● Cancel

67. CAN           (18)H (24)D

This command cancels all the print data in the buffer. However, the control codes are still valid.

```
1234567890

10  PRINT  CHR$ (4);"PR#1"
20  PRINT "ABCDEFGHIJKL";
30  PRINT  CHR$ (24);
40  PRINT "1234567890"
50  LIST
60  PRINT  CHR$ (4);"PR#0"
```

## • Software Reset

68.  [ ESC c ]                     (1B, 63)H  (27, 99)D

Input of this command prints out all the data that has already been input and resets
the printer, except the vertical tab settings.

## • LF Function

69.  [ ESC ℓ 1 ]                   (1B, 6C, 31)H  (27, 108, 49)D

After the input of this command, an LF code performs a line feed only. The next line
of printing starts directly below where the previous line left off. If the LF code has
not been designated by DIP switch 2-2 as a print command, the LF code input will be
ignored.

```
LINE FEED
          LF 1
LF 2

  10  PRINT  CHR$ (4);"PR#1"
  20  PRINT "LINE FEED",
  30  PRINT  CHR$ (27);"11"; CHR$ (10);
  40  PRINT "LF 1";
  50  PRINT  CHR$ (27);"10"; CHR$ (10);
  60  PRINT "LF 2"
  70  LIST
  80  PRINT  CHR$ (4);"PR#0"
```

70.  [ ESC ℓ 0 ]                   (1B, 6C, 30)H  (27, 108, 48)D

After the input of this command, an LF code performs a line feed and carriage return.
The next line of printing starts at the left margin positions.
If the LF code has not been designated by DIP switch 2-2 as a print command, the LF
code input will be ignored.

Refer to 69.

## • CR Function

At power-on, DIP switch 1-8 selects this function.

| SWITCH | Function |
|--------|----------|
| ON | CR + LF |
| OFF | CR only |

71. ESC Z 80 00        (1B, 5A, 80, 00)H (27, 90, 128, 0)D

After the input of this command, a CR code performs a carriage return only.
Turning DIP switch 1-8 off is identical to this command.

72. ESC D 80 00        (1B, 44, 80,00)H (27, 68, 128, 0)D

After the input of this command, a CR code performs a carriage return and line feed.
Turning DIP switch 1-8 on is identical to this command.

## • Automatic Printing

When the print position exceeds the right margin, the contents in the buffer are automatically printed out.
This is called the automatic printing.

73. ESC Z 20 00        (1B, 5A, 20, 00)H (27, 90, 32, 0)D

After the input of this command, a line feed is not added to the automatic printing.
Turning DIP switch 2-3 off is identical to this command.

74. ESC D 20 00        (1B, 44, 20, 00)H (27, 68, 32,0)D

After the input of this command, a line feed is added to the automatic printing.
Turning DIP switch 2-3 on is identical to this command.

## • Data length

Control codes like the CR function need the 8th bit (MSB) data.
To use Applesoft Basic, which always outputs "1" for the 8th bit of data, DIP switch 1-5 at the back of the printer must be turned on to ignore the MSB. This is the default setting as shipped.

75. ESC Z 00 20          (1B, 5A, 00, 20) H  (27, 90, 0, 32) D

This command recognizes the 8th bit (MSB) of data and is identical to DIP switch 1-5 being off.

76. ESC D 00 20          (1B, 44, 00, 20) H  (27, 68, 0, 32) D

This command ignores the 8th bit of data and is identical to turning on DIP switch 1-5.

## ● Zero Font

77.  $\boxed{\text{ESC} \mid \text{Z} \mid 00 \mid 01}$        (1B, 5A, 00, 01) H (27, 90, 0, 1) D

After this command, the numeral zero is printed without a slash (0).
Turning DIP switch 2-1 off is identical to this command.

```
00000
00000

    10  PRINT  CHR$ (4);"PR#1"
    20  PRINT  CHR$ (27);"D"; CHR$ (0), CHR$ (1);
    30  PRINT "00000"
    40  PRINT  CHR$ (27);"Z"; CHR$ (0); CHR$ (1);
    50  PRINT "00000"
    60  LIST
    70  PRINT  CHR$ (4),"PR#0"
```

78.  $\boxed{\text{ESC} \mid \text{D} \mid 00 \mid 01}$        (1B, 44, 00, 01) H (27, 68, 0, 1) D

After this command, the numeral zero is printed with a slash (Ø).
Turning DIP switch 2-1 on is identical to this command.

Refer to 77.

## ● Print Command

DIP switch 2-2 is identical to the following commands.

79.  $\boxed{\text{ESC} \mid \text{Z} \mid 40 \mid 00}$        (1B, 5A, 40, 00) H (27, 90, 64, 0) D

This command designates that only the CR code is a print command.

80.  $\boxed{\text{ESC} \mid \text{D} \mid 40 \mid 00}$        (1B, 44, 40, 00) H (27, 68, 64, 0) D

This command designates that the CR, LF, VT, and FF codes are all print commands.

## ● Foreign Characters

Input of the following commands select alternate foreign characters among 7 different language fonts.

81. | ESC | Z | 07 | 00 |  (1B, 5A, 07, 00) H    . . . . . USA
    (27, 90, 7, 0,) D

82. | ESC | Z | 04 | 00 | ESC | D | 03 | 00 |  (1B, 5A, 04, 00, 1B, 44, 03, 00) H    . . . . . . . British
    (27, 90, 4, 0, 27, 68, 3, 0) D

83. | ESC | Z | 03 | 00 | ESC | D | 04 | 00 |  (1B, 5A, 03, 00, 1B, 44, 04, 00) H    . . . . . German
    (27, 90, 3, 0, 27, 68, 4, 0) D

84. | ESC | Z | 01 | 00 | ESC | D | 06 | 00 |  (1B, 5A, 01, 00, 1B, 44, 06, 00) H    . . . . . . French
    (27, 90, 1, 0, 27, 68, 6, 0) D

85. | ESC | Z | 02 | 00 | ESC | D | 05 | 00 |  (1B, 5A, 02, 00, 1B, 44, 05, 00) H    . . . . Swedish
    (27, 90, 2, 0, 27, 68, 5, 0) D

86. | ESC | Z | 06 | 00 | ESC | D | 01 | 00 |  (1B, 5A, 06, 00, 1B, 44, 01, 00) H    . . . . . . . Italian
    (27, 90, 6, 0, 27, 68, 1, 0) D

87. | ESC | D | 07 | 00 |  (1B, 44, 07, 00) H    . . . . . Spanish
    (27, 68, 7, 0) D

88. | ESC | Z | 05 | 00 | ESC | D | 02 | 00 |  (1B, 5A, 05, 00, 1B, 44, 02, 00) H    . . . . . USA
    (27, 90, 5, 0, 27, 68, 2, 0) D

The table below shows the characters in each language font.

| Code / Language | Alternate Characters | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (35)D (23)H | (64)D (40)H | (91)D (5B)H | (92)D (5C)H | (93)D (5D)H | (96)D (60)H | (123)D (7B)H | (124)D (7C)H | (125)D (7D)H | (126)D (7E)H |
| USA | # | @ | [ | \ | ] | ` | { | \| | } | ~ |
| British | £ | @ | [ | \ | ] | ` | { | \| | } | ~ |
| German | # | § | Ä | Ö | Ü | ` | ä | ö | ü | ß |
| French | £ | à | ° | ç | § | ` | é | ù | è | ¨ |
| Swedish | # | @ | Ä | Ö | Å | ` | ä | ö | å | ~ |
| Italian | £ | § | ° | ç | é | ù | à | ò | è | ì |
| Spanish | £ | § | ¡ | Ñ | ¿ | ` | ° | ñ | ç | ~ |

**Note:** DIP switches 1-1, 1-2, and 1-3 work the same as the above commands.

```
#@[\]`{|}~
£@[\]`{|}~
#§ÄÖÜ`äöüß
£à°ç§`éùè¨
#@ÄÖÅ`äöå~
£§°çéùàòèì
£§¡Ñ¿``°ñç~
~{|}`]\[@#
```

## ● Automatic Paper Ejection

89.  ESC Z 00 08     (1B, 5A, 00, 08)H (27, 90, 0, 8)D

This command disables the automatic paper ejection that ejects the paper if a paper-out condition is detected. Turning DIP switch 2-4 off is identical to this command.

90.  ESC D 00 08     (1B, 44, 00, 08)H (27, 68, 0, 8)D

This command enables the automatic paper ejection.
Turning DIP switch 2-4 on is identical to this command.

# TROUBLESHOOTING

Use the table below to diagnose any problems that may occur. If you cannot solve the problem, try to decide what part of your system is not working properly and consult your dealer.

| PROBLEM | CAUSE AND REMEDY |
|---|---|
| The printer does not print. The POWER lamp does not light. | 1) Power is not getting to the printer. <br> • Check the power cord and power switch. |
| The printer does not print. The POWER lamp is lit. | 1) The connection to the computer is not correct. <br> • Check that the cable connecting the printer and computer is correctly connected. <br> 2) The ribbon cassette is not properly installed. <br> • Properly install it. |
| The printer is operating properly, but the paper is not feeding through properly. | 1) The paper is jammed in the printer. <br> • Remove the paper and reinsert it properly. |
| The print is light or smeared. | 1) The print head position is not correct. <br> • Move the head adjustment lever to match the paper being used. <br> 2) The ribbon cassette is not properly installed. <br> • Properly install the cassette. <br> 3) The ink ribbon is old or is worn out. <br> • Replace the old ribbon cassette with a new one. |
| The PAPER OUT lamp is blinking. | 1) An error condition has been detected. <br> • Turn power off and then back on again. |

# CAUTIONS FOR USE

- Do not use a power supply voltage that is out of the specified range.
- Do not touch the print head immediately after printing because it is too hot.
- Be careful not to twist the ribbon while installing it.
- Wait at least two seconds after turning power off before turning it back on again. The initialization process may not be performed correctly if this is not done.
- The printer should be used when the humidity is low, when there is little dust, and where the printer is not in direct sunlight.
- Do not perform printing without the ribbon cassette and paper properly installed.
- Never install the tractor unit when using friction feed for cut sheet paper.
- When using continuous forms, the paper bail must be set to the platen side; otherwise, a paper jam may occur.

# RS-232C Serial Interface

Transmission Speed:
  110, 300, 600, 1200, 2400, 4800, 9600, or 19200 baud

Data Input Form:
  Start bit ..................... 1 bit
  Data length ............... 7 or 8 bits
  Parity bit .................. Odd, even or no
  Stop bit(s) ................ 1 bit or more (when data length is 7 bits, 2 bits or more
                              are needed)

Signal Polarity:
  Signal lines ............... Mark = logical '1', $-3 \sim -24V$
                              Space = logical '0', $+3 \sim +24V$
  Control lines ............. ON, $+3 \sim +24V$
                              OFF, $-3 \sim -24V$

Handshake Protocol:
  BUSY/READY protocol (Pin nos. 11 and 20)
    ON ......................... The printer can receive data (READY).
    OFF ....................... The printer cannot receive data (BUSY).

  X-ON/X-OFF protocol (Pin no. 2)
    Output X-ON (11 Hex) ............... The printer can receive data.
    Output X-OFF (13 Hex) ............. The printer cannot receive data.

## INPUT CONNECTOR: 25-PIN, D-SUB
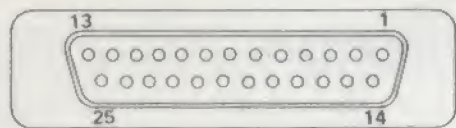


| PIN | SIGNAL | DIRECTION | DESCRIPTION |
|---|---|---|---|
| 1 | F. GND | — | Frame ground |
| 2 | TXD | Output | Mark state in BUSY/READY protocol<br>Output X-ON/X-OFF in X-ON/X-OFF protocol |
| 3 | RXD | Input | Receive data |
| 4 | RTS * | Output | Request to send in ON state |
| 5 | CTS * | Input | Clear to send in ON state |
| 6 | DSR * | Input | Data set ready in ON state |
| 7 | S. GND | — | Signal ground |
| 8 | CD * | Input | Computer is ready to send data<br>(Carrier detected) |
| 11 | SRTS | Output | Ready to receive data in ON state<br>(Secondary request to send) |
| 20 | DTR | Output | Ready to receive data in ON state<br>(Data terminal ready) |

**Table 1**

* If DSR is to be used, cut J3 and jumper J4 on the serial circuit board in the printer.
  If CD is to be used, cut J3 and jumper J2.
  If CTS is to be used, cut J5 and jumper J6 because RTS and CTS are connected on the circuit board.

# DIP SWITCH SETTINGS ON THE SERIAL INTERFACE BOARD

**Note:** To connect the printer to a Macintosh or Apple IIc, do not change the DIP switch settings.

| Switch | Function | ON | OFF | Setting as shipped |
|--------|----------|-----|-----|--------------------|
| 1–1 | | | | ON |
| 1–2 | Baud rate selection | See Table 3 | | OFF |
| 1–3 | | | | OFF |
| 1–4 | Data length | 7 bits | 8 bits | OFF |
| 1–5 | 8th bit control (MSB) | See Table 4 | | OFF |
| 1–6 | | | | OFF |
| 1–7 | Parity bit used | Yes | No | OFF |
| 1–8 | Parity bit selection | Odd | Even | OFF |
| 2–1 | Protocol | X-ON/X-OFF | BUSY/READY | OFF |
| 2–2 | Remaining buffer space to go busy* | 512 bytes | 128 bytes | ON |

**Table 2**

*: Refer to 'Remaining buffer space'.

| SWITCH | | | Baud rate (BPS) |
|--------|--------|--------|-----------------|
| 1–3 | 1–2 | 1–1 | |
| ON | ON | ON | 110 |
| ON | ON | OFF | 300 |
| ON | OFF | ON | 600 |
| ON | OFF | OFF | 1200 |
| OFF | ON | ON | 2400 |
| OFF | ON | OFF | 4800 |
| OFF | OFF | ON | 9600 |
| OFF | OFF | OFF | 19200 |

**Table 3**

| SWITCH | | Input data's 8th-bit control (MSB) |
|--------|--------|------------------------------------|
| 1–6 | 1–5 | |
| ON | ON | $D_8$ is always '0' |
| ON | OFF | $D_8$ is always '1' |
| OFF | ON | Change the $D_8$ bit |
| OFF | OFF | Receive data as it is |

**Table 4**

* $D_8$ is the Most-Significant Bit (MSB).

69

## JUMPERS

| Jumper | Setting as shipped | Description |
|--------|--------------------|-------------|
| J 1 | ON | To use the CD control line, cut J1 and jumper J2. |
| J 2 | OFF | |
| J 3 | ON | To use the DSR control line, cut J3 and jumper J4. |
| J 4 | OFF | |
| J 5 | ON | To use the CTS control line, cut J5 and jumper J6. |
| J 6 | OFF | |
| J 7 | OFF | To connect F. GND to S. GND, jumper J7. |
| J18 | OFF | To change DTR signal polarity, jumper J18. |

## ERROR DURING INPUTTING DATA

If an error, such as a parity error, occurs while receiving data, one "*" (2A code in hexadecimal) per one data error is transmitted to the printer.

Input data that exceed the communication buffer capacity (2K) are ignored.

## REMAINING BUFFER SPACE

The relationship among READY (X-ON), BUSY (X-OFF), and remaining buffer space is shown below.



**Remaining buffer space (bytes)**
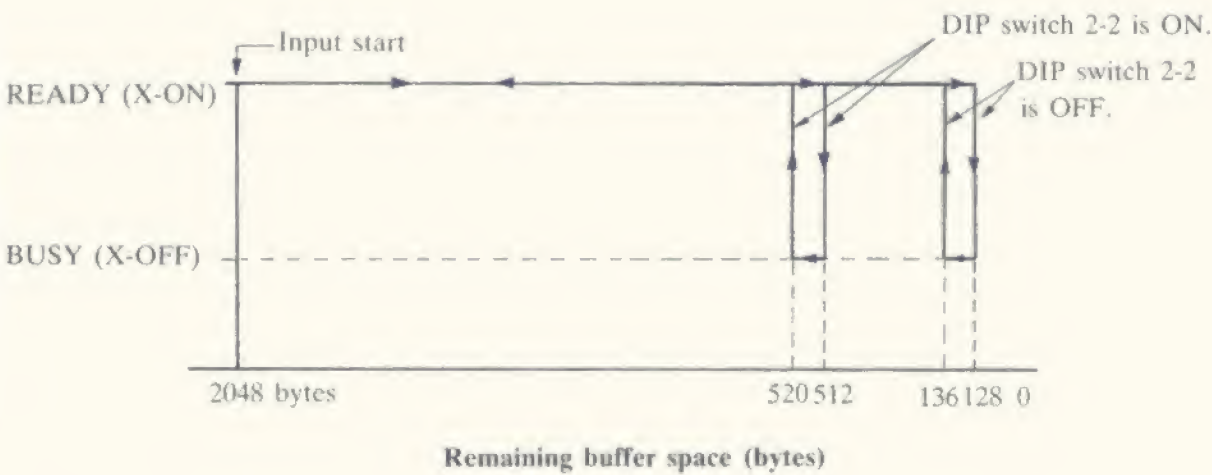
At power-on, the printer is in the READY (X-ON) state since the communication buffer is empty.

When the remaining space of the buffer goes below 128 bytes or 512 bytes (selected by DIP switch 2-2), the printer enters the BUSY (X-OFF) state. The printer can receive up to 128 or 512 bytes more after it enters the BUSY (X-OFF) state. When the remaining buffer space increases by 8 bytes or more, the printer returns to the READY (X-ON) state.

**BUSY/READY, X-ON/X-OFF, DTR, and SRTS Timing Chart**
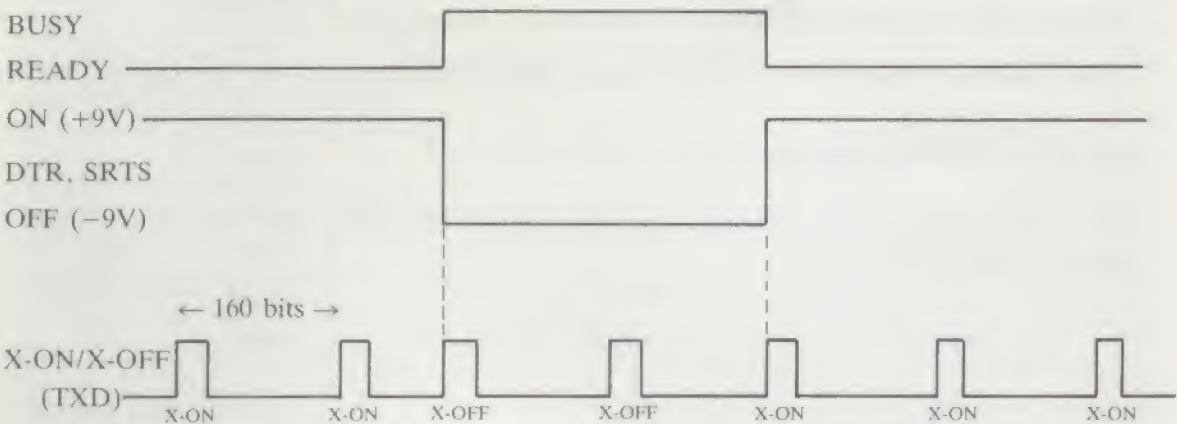


X-ON (11 HEX) and X-OFF (13 HEX) are transmitted every 160 bits of the present data transfer rate (baud rate).
These signals are output through the TXD line.
The data format is the same as the input data structure.

# Printing Specifications

|  | Type | Character or dot spacing | Maximum character column | Maximum dot column | Print speed |
|---|---|---|---|---|---|
| STANDARD CHARACTER | Extended | 9 cpi | 72 | 576 | 68 cps |
|  | Pica | 10 cpi | 80 | 640 | 75 cps |
|  | Elite | 12 cpi | 96 | 768 | 37 cps |
|  | Semicondensed | 13.4 cpi | 107 | 856 | 41 cps |
|  | Condensed | 15 cpi | 120 | 960 | 46 cps |
|  | Ultra-condensed | 17 cpi | 136 | 1088 | 52 cps |
|  | Pica Proportional | 1/144″ | — | 1152 | 441 dots/s |
|  | Elite Proportional | 1/160″ | — | 1280 | 490 dots/s |
| NEAR LETTER QUALITY (N.L.Q.) CHARACTER | Extended | 9 cpi | 72 | 1152 | 14 cps |
|  | Pica | 10 cpi | 80 | 1280 | 15 cps |
|  | Elite | 12 cpi | 96 | 1536 | 18 cps |
| GRAPHICS | 576 | 1/72″ | — | 576 | 544 dots/s |
|  | 640 | 1/80″ | — | 640 | 600 dots/s |
|  | 768 | 1/96″ | — | 768 | 294 dots/s |
|  | 856 | 1/107″ | — | 856 | 328 dots/s |
|  | 960 | 1/120″ | — | 960 | 368 dots/s |
|  | 1088 | 1/136″ | — | 1088 | 416 dots/s |
|  | 1152 | 1/144″ | — | 1152 | 441 dots/s |
|  | 1280 | 1/160″ | — | 1280 | 490 dots/s |

## _APPENDIX C

## ASCII, Binary, and Hexadecimal Codes

The first 32 codes are control characters set by pressing the CONTROL key simultaneously with the desired character key.

| ASCII | | Dec | Hex | 76543210 | Dot-column width for proportional | Dec | Hex | 76543210 |
|-------|------|-----|-----|----------|-----------------------------------|-----|-----|----------|
| CONTROL-@ | | 0 | 00 | 00000000 | | 128 | 80 | 10000000 |
| CONTROL-A | | 1 | 01 | 00000001 | | 129 | 81 | 10000001 |
| CONTROL-B | | 2 | 02 | 00000010 | | 130 | 82 | 10000010 |
| CONTROL-C | | 3 | 03 | 00000011 | | 131 | 83 | 10000011 |
| CONTROL-D | EOT | 4 | 04 | 00000100 | | 132 | 84 | 10000100 |
| CONTROL-E | | 5 | 05 | 00000101 | | 133 | 85 | 10000101 |
| CONTROL-F | | 6 | 06 | 00000110 | | 134 | 86 | 10000110 |
| CONTROL-G | | 7 | 07 | 00000111 | | 135 | 87 | 10000111 |
| CONTROL-H | BS | 8 | 08 | 00001000 | | 136 | 88 | 10001000 |
| CONTROL-I | HT | 9 | 09 | 00001001 | | 137 | 89 | 10001001 |
| CONTROL-J | LF | 10 | 0A | 00001010 | | 138 | 8A | 10001010 |
| CONTROL-K | VT | 11 | 0B | 00001011 | | 139 | 8B | 10001011 |
| CONTROL-L | FF | 12 | 0C | 00001100 | | 140 | 8C | 10001100 |
| CONTROL-M | CR | 13 | 0D | 00001101 | | 141 | 8D | 10001101 |
| CONTROL-N | SO | 14 | 0E | 00001110 | | 142 | 8E | 10001110 |
| CONTROL-O | SI | 15 | 0F | 00001111 | | 143 | 8F | 10001111 |
| CONTROL-P | | 16 | 10 | 00010000 | | 144 | 90 | 10010000 |
| CONTROL-Q | | 17 | 11 | 00010001 | | 145 | 91 | 10010001 |
| CONTROL-R | | 18 | 12 | 00010010 | | 146 | 92 | 10010010 |
| CONTROL-S | | 19 | 13 | 00010011 | | 147 | 93 | 10010011 |
| CONTROL-T | | 20 | 14 | 00010100 | | 148 | 94 | 10010100 |
| CONTROL-U | | 21 | 15 | 00010101 | | 149 | 95 | 10010101 |
| CONTROL-V | | 22 | 16 | 00010110 | | 150 | 96 | 10010110 |
| CONTROL-W | | 23 | 17 | 00010111 | | 151 | 97 | 10010111 |
| CONTROL-X | CAN | 24 | 18 | 00011000 | | 152 | 98 | 10011000 |
| CONTROL-Y | | 25 | 19 | 00011001 | | 153 | 99 | 10011001 |
| CONTROL-Z | | 26 | 1A | 00011010 | | 154 | 9A | 10011010 |
| CONTROL-[ | ESC | 27 | 1B | 00011011 | | 155 | 9B | 10011011 |
| CONTROL-\ | | 28 | 1C | 00011100 | | 156 | 9C | 10011100 |
| CONTROL-] | GS | 29 | 1D | 00011101 | | 157 | 9D | 10011101 |
| CONTROL-^ | RS | 30 | 1E | 00011110 | | 158 | 9E | 10011110 |
| CONTROL-_ | US | 31 | 1F | 00011111 | | 159 | 9F | 10011111 |
| | SP | 32 | 20 | 00100000 | 7 | 160 | A0 | 10100000 |
| | ! | 33 | 21 | 00100001 | 7 | 161 | A1 | 10100001 |
| | " | 34 | 22 | 00100010 | 10 | 162 | A2 | 10100010 |
| | # | 35 | 23 | 00100011 | 14* | 163 | A3 | 10100011 |

* Valid when the USA language is selected.

| ASCII | | Dec | Hex | 76543210 | Dot-column width for proportional | Dec | Hex | 76543210 |
|-------|---|-----|-----|----------|-----------------------------------|-----|-----|----------|
| | $ | 36 | 24 | 00100100 | 12 | 164 | A4 | 10100100 |
| | % | 37 | 25 | 00100101 | 16 | 165 | A5 | 10100101 |
| | & | 38 | 26 | 00100110 | 13 | 166 | A6 | 10100110 |
| | ' | 39 | 27 | 00100111 | 7 | 167 | A7 | 10100111 |
| | ( | 40 | 28 | 00101000 | 7 | 168 | A8 | 10101000 |
| | ) | 41 | 29 | 00101001 | 7 | 169 | A9 | 10101001 |
| | * | 42 | 2A | 00101010 | 12 | 170 | AA | 10101010 |
| | + | 43 | 2B | 00101011 | 12 | 171 | AB | 10101011 |
| | , | 44 | 2C | 00101100 | 7 | 172 | AC | 10101100 |
| | - | 45 | 2D | 00101101 | 12 | 173 | AD | 10101101 |
| | . | 46 | 2E | 00101110 | 7 | 174 | AE | 10101110 |
| | / | 47 | 2F | 00101111 | 12 | 175 | AF | 10101111 |
| | 0 | 48 | 30 | 00110000 | 12 | 176 | B0 | 10110000 |
| | 1 | 49 | 31 | 00110001 | 12 | 177 | B1 | 10110001 |
| | 2 | 50 | 32 | 00110010 | 12 | 178 | B2 | 10110010 |
| | 3 | 51 | 33 | 00110011 | 12 | 179 | B3 | 10110011 |
| | 4 | 52 | 34 | 00110100 | 12 | 180 | B4 | 10110100 |
| | 5 | 53 | 35 | 00110101 | 12 | 181 | B5 | 10110101 |
| | 6 | 54 | 36 | 00110110 | 12 | 182 | B6 | 10110110 |
| | 7 | 55 | 37 | 00110111 | 12 | 183 | B7 | 10110111 |
| | 8 | 56 | 38 | 00111000 | 12 | 184 | B8 | 10111000 |
| | 9 | 57 | 39 | 00111001 | 12 | 185 | B9 | 10111001 |
| | : | 58 | 3A | 00111010 | 7 | 186 | BA | 10111010 |
| | ; | 59 | 3B | 00111011 | 7 | 187 | BB | 10111011 |
| | < | 60 | 3C | 00111100 | 12 | 188 | BC | 10111100 |
| | = | 61 | 3D | 00111101 | 12 | 189 | BD | 10111101 |
| | > | 62 | 3E | 00111110 | 12 | 190 | BE | 10111110 |
| | ? | 63 | 3F | 00111111 | 12 | 191 | BF | 10111111 |
| | @ | 64 | 40 | 01000000 | 14* | 192 | C0 | 11000000 |
| | A | 65 | 41 | 01000001 | 16 | 193 | C1 | 11000001 |
| | B | 66 | 42 | 01000010 | 15 | 194 | C2 | 11000010 |
| | C | 67 | 43 | 01000011 | 14 | 195 | C3 | 11000011 |
| | D | 68 | 44 | 01000100 | 15 | 196 | C4 | 11000100 |
| | E | 69 | 45 | 01000101 | 15 | 197 | C5 | 11000101 |
| | F | 70 | 46 | 01000110 | 15 | 198 | C6 | 11000110 |
| | G | 71 | 47 | 01000111 | 14 | 199 | C7 | 11000111 |

* Valid when the USA language is selected.

| ASCII | | Dec | Hex | 76543210 | Dot-column width for proportional | Dec | Hex | 76543210 |
|---|---|---|---|---|---|---|---|---|
| | H | 72 | 48 | 01001000 | 15 | 200 | C8 | 11001000 |
| | I | 73 | 49 | 01001001 | 9 | 201 | C9 | 11001001 |
| | J | 74 | 4A | 01001010 | 13 | 202 | CA | 11001010 |
| | K | 75 | 4B | 01001011 | 12 | 203 | CB | 11001011 |
| | L | 76 | 4C | 01001100 | 13 | 204 | CC | 11001100 |
| | M | 77 | 4D | 01001101 | 17 | 205 | CD | 11001101 |
| | N | 78 | 4E | 01001110 | 16 | 206 | CE | 11001110 |
| | O | 79 | 4F | 01001111 | 15 | 207 | CF | 11001111 |
| | P | 80 | 50 | 01010000 | 13 | 208 | D0 | 11010000 |
| | Q | 81 | 51 | 01010001 | 16 | 209 | D1 | 11010001 |
| | R | 82 | 52 | 01010010 | 15 | 210 | D2 | 11010010 |
| | S | 83 | 53 | 01010011 | 12 | 211 | D3 | 11010011 |
| | T | 84 | 54 | 01010100 | 14 | 212 | D4 | 11010100 |
| | U | 85 | 55 | 01010101 | 15 | 213 | D5 | 11010101 |
| | V | 86 | 56 | 01010110 | 16 | 214 | D6 | 11010110 |
| | W | 87 | 57 | 01010111 | 17 | 215 | D7 | 11010111 |
| | X | 88 | 58 | 01011000 | 11 | 216 | D8 | 11011000 |
| | Y | 89 | 59 | 01011001 | 14 | 217 | D9 | 11011001 |
| | Z | 90 | 5A | 01011010 | 11 | 218 | DA | 11011010 |
| | [ | 91 | 5B | 01011011 | 12* | 219 | DB | 11011011 |
| | \ | 92 | 5C | 01011100 | 12* | 220 | DC | 11011100 |
| | ] | 93 | 5D | 01011101 | 12* | 221 | DD | 11011101 |
| | ^ | 94 | 5E | 01011110 | 12 | 222 | DE | 11011110 |
| | — | 95 | 5F | 01011111 | 17 | 223 | DF | 11011111 |
| | . | 96 | 60 | 01100000 | 7* | 224 | E0 | 11100000 |
| | a | 97 | 61 | 01100001 | 12 | 225 | E1 | 11100001 |
| | b | 98 | 62 | 01100010 | 12 | 226 | E2 | 11100010 |
| | c | 99 | 63 | 01100011 | 10 | 227 | E3 | 11100011 |
| | d | 100 | 64 | 01100100 | 12 | 228 | E4 | 11100100 |
| | e | 101 | 65 | 01100101 | 12 | 229 | E5 | 11100101 |
| | f | 102 | 66 | 01100110 | 10 | 230 | E6 | 11100110 |
| | g | 103 | 67 | 01100111 | 12 | 231 | E7 | 11100111 |
| | h | 104 | 68 | 01101000 | 12 | 232 | E8 | 11101000 |
| | i | 105 | 69 | 01101001 | 8 | 233 | E9 | 11101001 |
| | j | 106 | 6A | 01101010 | 7 | 234 | EA | 11101010 |
| | k | 107 | 6B | 01101011 | 10 | 235 | EB | 11101011 |

* Valid when the USA language is selected.

76

| ASCII | | Dec | Hex | 76543210 | Dot-column width for proportional | Dec | Hex | 76543210 |
|---|---|---|---|---|---|---|---|---|
| | l | 108 | 6C | 01101100 | 8 | 236 | EC | 11101100 |
| | m | 109 | 6D | 01101101 | 16 | 237 | ED | 11101101 |
| | n | 110 | 6E | 01101110 | 12 | 238 | EE | 11101110 |
| | o | 111 | 6F | 01101111 | 12 | 239 | EF | 11101111 |
| | p | 112 | 70 | 01110000 | 12 | 240 | F0 | 11110000 |
| | q | 113 | 71 | 01110001 | 12 | 241 | F1 | 11110001 |
| | r | 114 | 72 | 01110010 | 10 | 242 | F2 | 11110010 |
| | s | 115 | 73 | 01110011 | 12 | 243 | F3 | 11110011 |
| | t | 116 | 74 | 01110100 | 10 | 244 | F4 | 11110100 |
| | u | 117 | 75 | 01110101 | 12 | 245 | F5 | 11110101 |
| | v | 118 | 76 | 01110110 | 12 | 246 | F6 | 11110110 |
| | w | 119 | 77 | 01110111 | 16 | 247 | F7 | 11110111 |
| | x | 120 | 78 | 01111000 | 12 | 248 | F8 | 11111000 |
| | y | 121 | 79 | 01111001 | 12 | 249 | F9 | 11111001 |
| | z | 122 | 7A | 01111010 | 10 | 250 | FA | 11111010 |
| | { | 123 | 7B | 01111011 | 10* | 251 | FB | 11111011 |
| | \| | 124 | 7C | 01111100 | 7* | 252 | FC | 11111100 |
| | } | 125 | 7D | 01111101 | 10* | 253 | FD | 11111101 |
| | ~ | 126 | 7E | 01111110 | 13* | 254 | FE | 11111110 |
| | | 127 | 7F | 01111111 | | 255 | FF | 11111111 |

* Valid when the USA language is selected.

The table below shows dot-column width of Proportional characters

| Code / Language | Alternate Characters | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (35)D (23)H | (64)D (40)H | (91)D (5B)H | (92)D (5C)H | (93)D (5D)H | (96)D (60)H | (123)D (7B)H | (124)D (7C)H | (125)D (7D)H | (126)D (7E)H |
| USA | # (14) | @ (14) | [ (12) | \ (12) | ] (12) | ` (7) | { (10) | \| (7) | } (10) | ~ (13) |
| British | £ (13) | @ (14) | [ (12) | \ (12) | ] (12) | ` (7) | { (10) | \| (7) | } (10) | ~ (13) |
| German | # (14) | § (12) | Ä (16) | Ö (15) | Ü (15) | ` (7) | ä (12) | ö (12) | ü (12) | ß (14) |
| French | £ (13) | à (12) | ° (13) | ç (10) | § (12) | ` (7) | é (12) | ù (12) | è (12) | ¨ (13) |
| Swedish | # (14) | @ (14) | Ä (16) | Ö (15) | Å (16) | ` (7) | ä (12) | ö (12) | å (12) | ⁻ (13) |
| Italian | £ (13) | § (12) | ° (13) | ç (10) | é (12) | ù (12) | à (12) | ò (12) | è (12) | ì (8) |
| Spanish | £ (13) | § (12) | i (7) | Ñ (16) | ¿ (12) | ` (7) | ° (13) | ñ (12) | ç (10) | ~ (13) |

77

# DIP Switches at the Back of the Printer

The DIP switches are located at the rear of the printer and covered with the plastic lid. The DIP switches are read after the initialization process either by turning the power switch on or inputting an $\boxed{\text{ESC}}\,\boxed{\text{c}}$ command.

| DIP Switch | Function | ON | OFF | Setting as shipped |
|---|---|---|---|---|
| 1-1 | Language fonts selection | See below | | OFF |
| 1-2 | | | | OFF |
| 1-3 | | | | OFF |
| 1-4 | Page length | 72 lines | 66 lines | OFF |
| 1-5 | Data length | 7 bits* | 8 bits | ON |
| 1-6 | Print character mode selected at power-on | See below | | ON |
| 1-7 | | | | OFF |
| 1-8 | CR function | CR+LF | CR only | OFF |
| 2-1 | Zero font | Ø | 0 | OFF |
| 2-2 | Print command | CR,LF,VT,FF | CR | ON |
| 2-3 | Automatic printing | CR+LF | CR only | OFF |
| 2-4 | Automatic paper ejection | Enabled | Disabled | OFF |

*: When 7-bit data length is selected, the printer ignores the 8th bit (MSB) of data within the printer.

Language Fonts Setting Table

| DIP switch | | | | Print character code | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-1 | 1-2 | 1-3 | Language | 35D 23H | 64D 40H | 91D 5BH | 92D 5CH | 93D 5DH | 96D 60H | 123D 7BH | 124D 7CH | 125D 7DH | 126D 7EH |
| *OFF | OFF | OFF | USA | # | @ | [ | \ | ] | ` | { | \| | } | ~ |
| ON | ON | OFF | British | £ | @ | [ | \ | ] | ` | { | \| | } | ~ |
| OFF | OFF | ON | German | # | § | Ä | Ö | Ü | ` | ä | ö | ü | ß |
| OFF | ON | ON | French | £ | à | ° | ç | § | ` | é | ù | è | ¨ |
| ON | OFF | ON | Swedish | # | @ | Ä | Ö | Å | ` | ä | ö | å | ~ |
| ON | OFF | OFF | Italian | £ | § | ° | ç | é | ù | à | ò | è | ì |
| ON | ON | ON | Spanish | £ | § | ¡ | Ñ | ¿ | ` | ° | ñ | ç | ~ |
| OFF | ON | OFF | USA | Same as the USA fonts above | | | | | | | | | |

* USA fonts are selected when shipped from the factory.

Print Character Mode

| DIP switch | | Print character |
|---|---|---|
| 1–6 | 1–7 | |
| OFF | OFF | Pica |
| ON | OFF | Elite |
| OFF | ON | Ultracondensed |
| ON | ON | Elite Proportional |

\* Elite is selected when shipped from the factory.

DIP switch 2
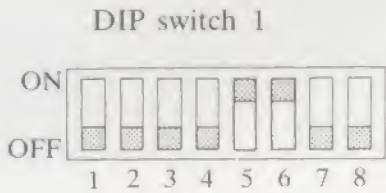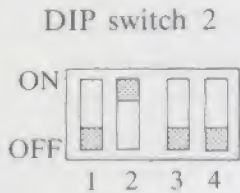
DIP switch 1

Remove the plastic cover to change DIP switch settings.

# Control Codes

| Category | Item | Code | Hex | Decimal | Function | Page |
|---|---|---|---|---|---|---|
| Print Command | 1 | CR (CONTROL-M) | 0D | 13 | Carriage return after printing | 22 |
| Line Feed | 2 | LF (CONTROL-J) | 0A | 10 | Line feed only | 22 |
| Vertical Tab | 3 | VT (CONTROL-K) | 0B | 11 | Goes to next vertical tab B | 23 |
| Form Feed | 4 | FF (CONTROL-L) | 0C | 12 | Form feed | 24 |
| Character Mode Designation | 5 | ESC n | 1B, 6E | 27, 110 | Extended (9 cpi) | 25 |
| | 6 | ESC N | 1B, 4E | 27, 78 | Pica (10 cpi) | 25 |
| | 7 | ESC E | 1B, 45 | 27, 69 | Elite (12 cpi) | 26 |
| | 8 | ESC p | 1B, 70 | 27, 112 | Pica proportional | 26 |
| | 9 | ESC P | 1B, 50 | 27, 80 | Elite proportional | 27 |
| | 10 | ESC e | 1B, 65 | 27, 101 | Semicondensed (13.4 cpi) | 27 |
| | 11 | ESC q | 1B, 71 | 27, 113 | Condensed (15 cpi) | 28 |
| | 12 | ESC Q | 1B, 51 | 27, 81 | Ultracondensed (17 cpi) | 28 |
| Bold Print | 13 | ESC ! | 1B, 21 | 27, 33 | Bold print mode designation | 29 |
| | 14 | ESC " | 1B, 22 | 27, 34 | Bold print mode termination | 29 |
| Double Width Print | 15 | SO (CONTROL-N) | 0E | 14 | Double width print mode designation | 30 |
| | 16 | SI (CONTROL-O) | 0F | 15 | Double width print mode termination | 30 |
| Near Letter Quality Character | 17 | ESC H | 1B, 48 | 27, 72 | Near Letter Quality character mode designation | 31 |
| | 18 | ESC h | 1B, 68 | 27, 104 | Near Letter Quality character mode termination | 31 |
| Italic Character | 19 | ESC i 1 | 1B, 69, 31 | 27, 105, 49 | Italic character mode desigantion | 32 |
| | 20 | ESC i 0 | 1B, 69, 30 | 27, 105, 48 | Italic character mode termination | 32 |
| Superscript/ Subscript Character | 21 | ESC b 0 | 1B, 62, 30 | 27, 98, 48 | Superscript/Subscript character termination | 33 |
| | 22 | ESC b 1 | 1B, 62, 31 | 27, 98, 49 | Superscript character mode designation | 33 |
| | 23 | ESC b 2 | 1B, 62, 32 | 27, 98, 50 | Subscript character mode desigantion | 33 |
| Underlining | 24 | ESC X | 1B, 58 | 27, 88 | Starts underlining | 34 |
| | 25 | ESC Y | 1B, 59 | 27, 89 | Stops underlining | 34 |
| Dot Spacing in Proportional | 26 | ESC n | 1B, 31~36 | 27, 49~54 | Takes n dots of space between given proportional characters (n = 1 ~ 6) | 35 |
| | 27 | ESC s n | 1B, 73, 30~39 | 27, 115, 48~57 | Takes n-dot spacing between all proportional characters (n = 0~9) | 36 |
| Backspacing | 28 | BS (CONTROL-H) | 08 | 8 | Backspaces one character | 36 |

| Category | Item | Code | Hex | Decimal | Function | Page |
|---|---|---|---|---|---|---|
| Horizontal Tab | 29 | HT (CONTROL-I) | 09 | 9 | Goes to next tab | 37 |
| | 30 | ESC ( | 1B, 28 | 27, 40 | Sets horizontal tabs | 37 |
| | 31 | ESC u | 1B, 75 | 27, 117 | Adds horizontal tab | 38 |
| | 32 | ESC ) | 1B, 29 | 27, 41 | Clears selected horizontal tabs | 38 |
| | 33 | ESC 0 | 1B, 30 | 27, 48 | Clears all tabs | 38 |
| Margin Setting | 34 | ESC L nnn | 1B, 4C | 27, 76 | Sets left margin to position nnn | 39 |
| | 35 | ESC / nnn | 1B, 2F | 27, 47 | Sets right margin to position nnn | 39 |
| Printing Direction | 36 | ESC > | 1B, 3E | 27, 62 | Unidirectional printing from left to right | 40 |
| | 37 | ESC < | 1B, 3C | 27, 60 | Bidirectional printing | 40 |
| Character Repetition | 38 | ESC R nnn C | 1B, 52 | 27, 82 | Prints nnn repetitions of a given character C | 40 |
| Line Feed Pitch | 39 | ESC A | 1B, 41 | 27, 65 | 6 lines per inch | 41 |
| | 40 | ESC B | 1B, 42 | 27, 66 | 8 lines per inch | 41 |
| | 41 | ESC T nn | 1B, 54 | 27, 84 | Distance between lines to be nn/144 inch  (nn = 01 to 99) | 42 |
| Line Feed Direction | 42 | ESC f | 1B, 66 | 27, 102 | Forward line feeding | 43 |
| | 43 | ESC r | 1B, 72 | 27, 114 | Reverse line feeding | 43 |
| VFU Vertical Tabs | 44 | GS (CONTROL-]) A @ | 1D, 41, 40 | 29, 65, 64 | Starts vertical tab settings (Sets TOF) | 45 |
| | 45 | C @ | 43, 40 | 67, 64 | Sets BOF | 46 |
| | 46 | A @ RS (CONTROL-^) | 41, 40, 1E | 65, 64, 30 | Ends vertical tab settings (Sets next TOF) | 46 |
| | 47 | US A~F | 1F | 31 | Performs vertical tab | 48 |
| Vertical Tab Initialization | 48 | GS 0 | 1D, 30 | 29, 48 | Sets vertical tabs to power-on state | 48 |
| Multiple Linefeeds | 49 | US (CONTROL-_) n | 1F | 31 | Feeds n lines of blank paper [n=1, 2, 3, 4, 5, 6, 7, 8, 9, : (10) ; (11), < (12), = (13), > (14), ?(15)] | 49 |
| TOF Setting | 50 | ESC v | 1B, 76 | 27, 118 | Sets TOF at current position | 50 |
| Download Character Loading | 51 | ESC − | 1B, 2D | 27, 45 | Maximum horizontal width is 8 dots | 51 |
| | 52 | ESC + | 1B, 2B | 27, 43 | Maximum horizontal width is 16 dots | 51 |
| | 53 | ESC I | 1B, 49 | 27, 73 | Starts loading | 51 |
| | 54 | EOT (CONTROL-D) | 04 | 4 | End loading | 51 |
| | 55 | A ... P | 41 ... 50 | 65 ... 80 | Designates width for top 8 wires (A = 1 ... P = 16) | 51 |
| | 56 | a ... p | 61 ... 70 | 97 ... 112 | Designates width for bottom 8 wires (a = 1 ... p = 16) | 52 |

| Category | Item | Code | Hex | Decimal | Function | Page |
|---|---|---|---|---|---|---|
| Download Character Printing | 57 | ESC ` | 1B, 27 | 27, 39 | Switches to download character set (32 ~ 126, 160 ~ 239) | 54 |
| | 58 | ESC ✳ | 1B, 2A | 27, 42 | Switches to download character set of high ASCII values (160–239) for 7-bit mode | 54 |
| | 59 | ESC $ | 1B, 24 | 27, 36 | Switches back to normal character set | 54 |
| Graphics | 60 | ESC G nnnn | 1B, 47 | 27, 71 | Prints line of nnnn data bytes that follow | 55 |
| | 61 | ESC S nnnn | 1B, 53 | 27, 83 | Same as ESC G | 56 |
| | 62 | ESC g nnn | 1B, 67 | 27, 103 | Prints line of (nnn×8) data bytes that follow | 56 |
| | 63 | ESC V nnnn C | 1B, 56 | 27, 86 | Prints nnnn repetitions of the dot column specified by C | 57 |
| Print Position | 64 | ESC F nnnn | 1B, 46 | 27, 70 | Designates the print position away from left margin in dot units specified by nnnn | 57 |
| Paper-Out Detector | 65 | ESC O | 1B, 4F | 27, 79 | Paper out detector off | 58 |
| | 66 | ESC o | 1B, 6F | 27, 111 | Paper out detector on | 58 |
| Cancel | 67 | CAN | 18 | 24 | Cancels all unprinted character in the buffer | 58 |
| Software Reset | 68 | ESC c | 1B, 63 | 27, 99 | Prints out all data and resets the printer | 59 |
| LF Function | 69 | ESC ℓ 1 | 1B, 6C, 31 | 27, 108, 49 | LF code performs a line feed only | 59 |
| | 70 | ESC ℓ 0 | 1B, 6C, 30 | 27, 108, 48 | LF code performs a line feed plus carriage return | 59 |
| CR Function | 71 | ESC Z 80 00 | 1B, 5A, 80, 00 | 27, 90, 128, 0 | CR code performs a carriage return only | 60 |
| | 72 | ESC D 80 00 | 1B, 44, 80, 00 | 27, 68, 128, 0 | CR code performs a carriage return plus line feed | 60 |
| Automatic Printing | 73 | ESC Z 20 00 | 1B, 5A, 20, 00 | 27, 90, 32, 0 | No linefeed performed after automatic printing | 60 |
| | 74 | ESC D 20 00 | 1B, 44, 20, 00 | 27, 68, 32, 0 | Performs line feed after automatic printing | 60 |
| Data Length | 75 | ESC Z 00 20 | 1B, 5A, 00, 20 | 27, 90, 0, 32 | Recognizes 8th bit (MSB) of data | 61 |
| | 76 | ESC D 00 20 | 1B, 44, 00, 20 | 27, 68, 0, 32 | Ignores 8th bit of data (7-bit mode) | 61 |
| Zero Font | 77 | ESC Z 00 01 | 1B, 5A, 00, 01 | 27, 90, 0, 1 | 0: unslashed zero | 62 |
| | 78 | ESC D 00 01 | 1B, 44, 00, 01 | 27, 68, 0, 1 | Ø: slashed zero | 62 |
| Print Command | 79 | ESC Z 40 00 | 1B, 5A, 40, 00 | 27, 90, 64, 0 | Only CR Code is a print command | 62 |
| | 80 | ESC D 40 00 | 1B, 44, 40, 00 | 27, 68, 64, 0 | CR, LF, VT, and FF codes are print commands | 62 |

| Category | Item | Code | Hex | Decimal | Function | Page |
|----------|------|------|-----|---------|----------|------|
| Foreign Characters | 81 | ESC Z 07 00 | 1B, 5A, 07, 00 | 27, 90, 7, 0 | USA | 63 |
| | 82 | ESC Z 04 00<br>ESC D 03 00 | 1B, 5A, 04, 00<br>1B, 44, 03, 00 | 27, 90, 4, 0<br>27, 68, 3, 0 | British | 63 |
| | 83 | ESC Z 03 00<br>ESC D 04 00 | 1B, 5A, 03, 00<br>1B, 44, 04, 00 | 27, 90, 3, 0<br>27, 68, 4, 0 | German | 63 |
| | 84 | ESC Z 01 00<br>ESC D 06 00 | 1B, 5A, 01, 00<br>1B, 44, 06, 00 | 27, 90, 1, 0<br>27, 68, 6, 0 | French | 63 |
| | 85 | ESC Z 02 00<br>ESC D 05 00 | 1B, 5A, 02, 00<br>1B, 44, 05, 00 | 27, 90, 2, 0<br>27, 68, 5, 0 | Swedish | 63 |
| | 86 | ESC Z 06 00<br>ESC D 01 00 | 1B, 5A, 06, 00<br>1B, 44, 01, 00 | 27, 90, 6, 0<br>27, 68, 1, 0 | Italian | 63 |
| | 87 | ESC D 07 00 | 1B, 44, 07, 00 | 27, 68, 7, 0 | Spanish | 63 |
| | 88 | ESC Z 05 00<br>ESC D 02 00 | 1B, 5A, 05, 00<br>1B, 44, 02, 00 | 27, 90, 5, 0<br>27, 68, 2, 0 | USA | 63 |
| Automatic Paper Ejection | 89 | ESC Z 00 08 | 1B, 5A, 00, 08 | 27, 90, 0, 8 | Disables automatic paper ejection | 64 |
| | 90 | ESC D 00 08 | 1B, 44, 00, 08 | 27, 68, 0, 8 | Enables automatic paper ejection | 64 |

## EPSON AMERICA, INC.
## LIMITED WARRANTY

Epson America, Inc. hereby warrants that it will repair or replace, at its option, any part of the Epson product with which this warranty is enclosed which proves defective by reason of improper workmanship and/or material, without charge for parts or labor, for a period of one (1) year. This warranty period commences on the date of original purchase by the buyer other than for purposes of resale, and this warranty applies only if such original purchase by the buyer was made in the United States.

To obtain service under this warranty you must return your Epson product, properly packaged in its original container or an equivalent, to the nearest authorized Epson Service Center or the Dealer from whom the product was purchased. Any postage, insurance and shipping costs incurred in presenting or sending your Epson product for service are your responsibility.

The Dealer's original bill of sale or other satisfactory proof of the date of the original buyer purchase of your Epson product must be made available to obtain service under this warranty.

This warranty applies only if your Epson product fails to function properly under normal use and within the manufacturer's specifications. Batteries, as well as optional software packages (ROMs) not contained in the original container of your Epson product, are excluded from coverage under this warranty. This warranty does not apply if the Epson label or logo, or the rating label or serial number, has been removed from your Epson product, or if, in the sole opinion of Epson, your Epson product has been damaged by faulty or leaking batteries not supplied by Epson, or by accident, misuse, neglect, or improper packing, shipping, modification or servicing, by other than Epson or an authorized Epson Service Center.

SOME EPSON PRODUCTS HAVE A COMPARTMENT CONTAINING STATIC-SENSITIVE ELECTRONIC CIRCUITRY. THIS COMPARTMENT IS CLEARLY LABELED. DO NOT OPEN IT! THIS WARRANTY WILL BECOME VOID IF YOU ATTEMPT TO MODIFY OR ADJUST ANY ROM OR OTHER PART OR DEVICE IN SUCH A COMPARTMENT, OR IF YOU ATTEMPT TO ADD OR INSERT ANY ROM OR OTHER PART OR DEVICE. IF ANY OF THESE STEPS IS REQUIRED, BRING YOUR EPSON PRODUCT TO AN AUTHORIZED EPSON DEALER.

THE DURATION OF ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE, ON YOUR EPSON PRODUCT SHALL BE LIMITED TO THE DURATION OF THE EXPRESS WARRANTY SET FORTH ABOVE. IN NO EVENT SHALL EPSON AMERICA, INC. OR ITS AFFILIATES BE LIABLE FOR ANY LOSS, INCONVENIENCE OR DAMAGE WHETHER DIRECT, INCIDENTAL, CONSEQUENTIAL OR OTHERWISE, OR WHETHER CAUSED BY NEGLIGENCE OR OTHER FAULT RESULTING FROM BREACH OF ANY EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE, WITH RESPECT TO YOUR EPSON PRODUCT, EXCEPT AS SET FORTH HEREIN. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS AND SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS AND EXCLUSIONS MAY NOT APPLY TO YOU.

You may request information on how to obtain service under this warranty by contacting the Dealer from whom your Epson product was purchased, or by contacting Epson America, Inc. at the address printed below:

Epson America, Inc.
Service Division
23610 Telo Street
Torrance, CA 90505
(213) 534-4234

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

# EPSON®

## AP-80 Printer

# User's Manual

**Chapters include:**

Setup instructions
Troubleshooting hints
Printer commands
Specifications

## Megabytes Of Memory:
## A RAM Card Buyer's Guide

More Than 50 New Product Reviews
Home Finance Software Revisited
Managing A Portfolio With AppleWorks
Speed Demons For The Apple IIe

0  74470 19436  1

61

## Printer Cards

Review

# Uniprint

## Inexpensive Graphics

When the Apple first came out, there was no way to dump a graphics screen to a printer. In fact, there was no way to print anything, since there were very few printers with graphics capabilities and no printer interface for the Apple. When Apple released the parallel interface card in 1978, it came with text capabilities, but it still could not print graphics. To this day, there is no printer graphics standard for the Apple II.

Several third party manufacturers, starting with Interactive Structures, made their own interface cards and customized them for various printers. If you had an Anadex printer with graphics, you would buy a special card customized for that printer; if you got an Okidata, you'd need a different card and so on.

On newer, more advanced graphics interface cards (usually referred to as "smart" interfaces), a set of switches determines which printer you are using. The Videx Uniprint is such a card. It's an inexpensive smart parallel interface card with built-in graphics commands.

To dump hi-res graphics on the Uniprint from a BASIC program, you simply send a Control-I G to the interface card and the picture will be dumped. Double, triple size, inverse, upside down and other modes can be selected easily. For example, putting the following command into an Applesoft BASIC program will tell the Uniprint to dump a triple size, inverse picture in the double hi-res graphics mode, on its side:

PRINT CHR$(9);"GTIXR"

The CHR$(9) is a Control-I that tells the Uniprint that a command is coming. The "G" indicates that the user wants a graphics dump. "T" indicates triple size, "I" indicates inverse (white dots on the screen
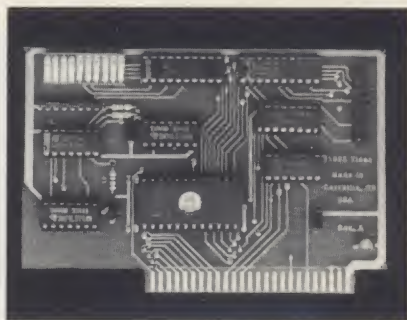


*Uniprint*

will show up as white dots on the page), "X" indicates extended (double) hi-res graphics mode, and "R" tells the Uniprint to rotate the picture 90 degrees. The printout will appear as a double hi-res screen sideways, and will fill an 8½ by 11-inch page.

The Uniprint is an excellent, low cost parallel graphics interface card. It is inexpensive, but not a cheap card. It comes with an excellent manual and full support from Videx. Many different printers are supported and the card even supports color graphics on the color Epson and Dataproducts printers.

Although Videx's official warranty period is 90 days, the company has always had excellent in and out of warranty support. Out of warranty upgrades are usually handled for a nominal charge and repairs are generally free, as long as the customer hasn't abused the unit.

If you want a printer interface for a parallel printer that can dump graphics with ease, then check out Uniprint.

**Product:** Uniprint
**Price:** $89
**Company:** Videx, Inc., 897 N.W. Grant Ave., Corvallis, Oreg. 97330, 503-758-0521
**Requirements:** Apple II, II+, IIe
**Supports:** Many printers, including Epson, Gemini, Okidata, Dataproducts, Apple DMP, Anadex, Gorilla, Centronics and similar graphics printers. Epson JX-80 and Dataproducts Prism are also supported in color modes. Special cable required for Dataproducts printers.
**Warranty:** 90 days

## Printers

# Epson AP-80

## An Imagewriter Alternative

The Epson AP-80 is an 80-column dot matrix printer that features hardware and software compatibility with the original Apple Imagewriter. According to the manufacturer, it provides Apple IIc and IIe users with high-resolution graphics as well as draft-quality and near-letter-quality output.

The Epson AP-80 weighs almost 10 pounds less than the Imagewriter, is smaller and offers the following features: selectable near-letter-quality (NLQ) printing capability and software-selectable italics, boldface, double-width printing, proportional spacing, superscripts and subscripts. All of these features can be set from the printer's front panel.

The AP-80 prints draft documents at 75 characters per second (CPS). In NLQ mode, it prints business letters at 15 CPS. It also prints bidirectionally and unidirectionally, under software control.

The manufacturer states that the AP-80 printer is equipped with both friction and adjustable tractor feeds. A built-in, single-sheet loading feature facilitates the handling of single-sheet paper without requiring the user to line up the paper once it is inserted.

**Product:** Epson AP-80
**Price:** $379
**Company:** Epson America, Computer Products Division, 2780 Lomita Blvd., Tor-



*Epson AP-80*